ENGINEERING NEWS-RECORD

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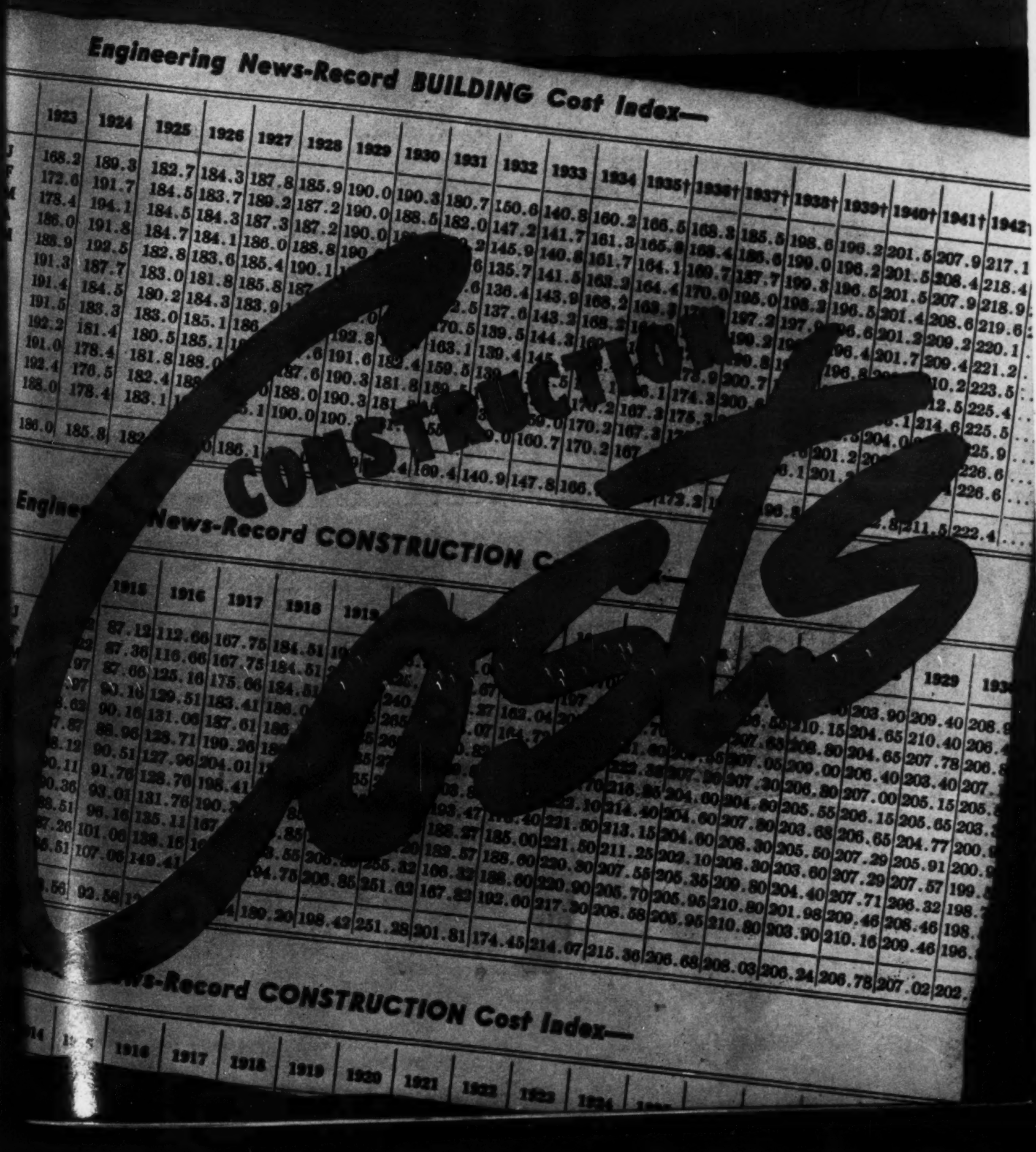
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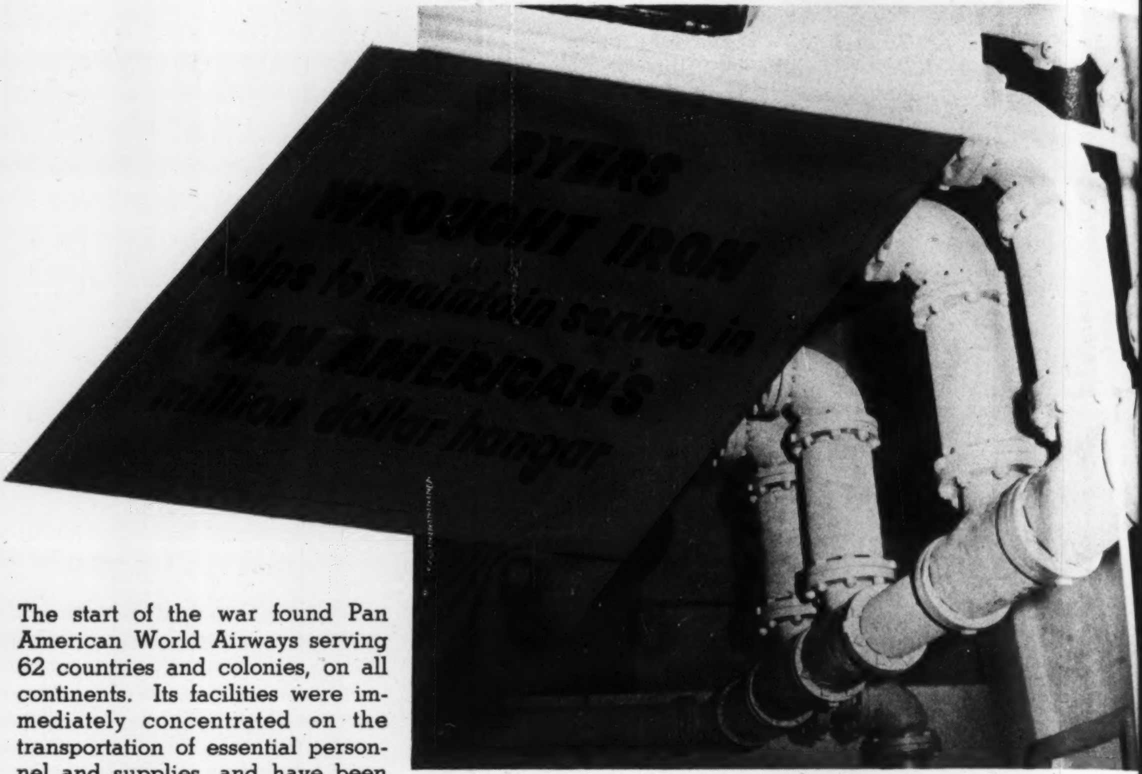


BYERS WROUGHT IRON helps to maintain service in PAN AMERICAN'S million dollar hangar

The start of the war found Pan American World Airways serving 62 countries and colonies, on all continents. Its facilities were immediately concentrated on the transportation of essential personnel and supplies, and have been continuously expanded. One development is the new hangar at Miami, containing over five acres of floor space where from twelve to eighteen planes can be serviced a day, and where the emphasis placed on complete dependability in all equipment is indicated even in the choice of the pipe. Byers Wrought Iron is used for all inside hot water lines and all steam return lines.

Because almost all airports today are military installations, detailed stories of their design and construction must wait until the end of the war. But it divulges no military secret to suggest some of the many services where experience recommends wrought iron. You will find it profitable to review these applications in connection with any current projects, or in blueprinting the greater program which everyone anticipates.

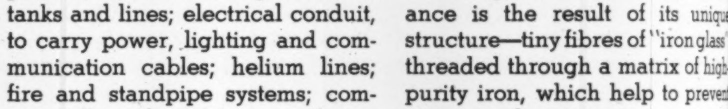
In addition to the heating, plumbing and sanitary lines in hangar buildings, Byers Wrought Iron provides an easy and economical way of extending the life of these important services: underground fuel tanks and lines; electrical conduit, to carry power, lighting and communication cables; helium lines; fire and standpipe systems; compressed air lines; water softener lines; hangar railings; and hangar door troughs. One very significant application is in radiant heating, which many expect will revolutionize the heating of hangars. The heat does not blow away, and so the chilling effect of excessive infiltration and numerous air changes is minimized. An interesting variation of the idea is the use of a pipe coil of Byers Wrought Iron around the hangar doors, to act as a "defroster."

Wrought Iron's corrosion resistance is the result of its unique structure—tiny fibres of "iron glass" threaded through a matrix of high-purity iron, which help to prevent pitting and penetration.

If you are concerned with airport design or construction, present or contemplated, and would like to have information on the performance of wrought iron in any corrosive application, our Engineering Service Department will gladly provide it.

A. M. Byers Company. Established 1864. Offices in Pittsburgh, Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

Corrosion costs you more than Wrought Iron



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GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE ALLOY STEELS · OPEN HEARTH ALLOY STEELS

CARBON STEEL TUBULAR PRODUCTS

CONSTRUCTION TRENDS

Notes on significant movements in the construction industry

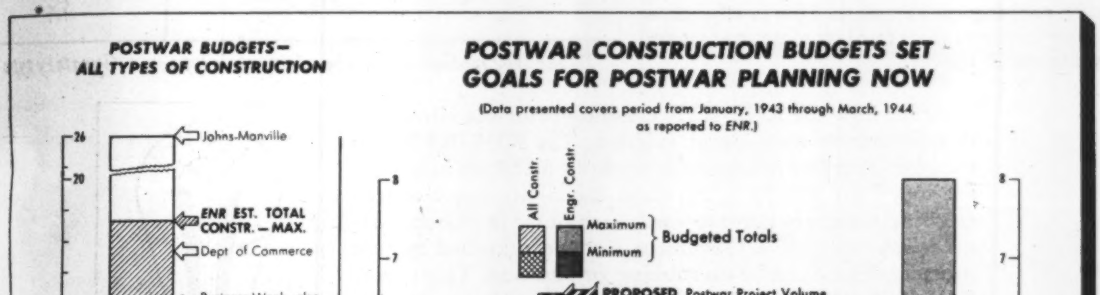
Postwar Construction Progress Report

PROJECTS PROPOSED for postwar construction total $6,798,936,000 for the fifteen months up to March 31, 1944. Of these proposed projects $2,185,077,000, or 32 percent have plans underway or completed according to reports to *Engineering News-Record.*

Proposed project volume is 78 percent of the minimum annual budget total and 52 percent of the maximum. Planning stage volume, the true measure of progress in postwar construction is only 25 percent of the minimum budget volume estimated for one postwar year by *ENR,* and 17 percent of the maximum.

Proposed waterworks, sewerage, bridge and earthwork projects exceed their maximum annual budgets, and highways almost equal their top budgeted total. Building construction and unclassified projects, however, are 79 and 41 percent lower, respectively, than their maximum budgets, and 69 and 22 percent below the minimums.

Sewerage volume in the planning stage is 10 percent above its minimum budget and bridge construction is 70 percent above. All other classes of work are under their minimum budgets.



ENR Business News

ENGINEERING NEWS-RECORD. Published every Thursday. Return postage guaranteed. Vol. 132, No. 16. Price 25c per copy. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 99-129 N. Broadway, Albany, 1, N. Y., or 330 W. 42nd Street, New York, 18, N. Y. Subscriptions, United States, U. S. Possessions and Latin American Republics, $5.00 for one year, $8.00 for two years, $10.00 for three years. Canada, $6.00 for one year, $10.00 for two years, $12.00 for three years. Great Britain and British Possessions 60 shillings for one year, 120 shillings for three years. All other countries, $9.00 for one year, $18.00 for three years. Entered as second-class matter October 29, 1936, at the Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in the U.S.A. Cable Address: "McGrawhill New York." Member A.B.P. Member A.B.C. Copyright 1944 by McGraw-Hill Publishing Company, Inc., James H. McGraw, Founder and Honorary Chairman; James H. McGraw, Jr., President; Howard Ehrlich, Executive Vice-President for Business Operations; John Abbink, Executive Vice-President for Editorial Operations; Curtis W. McGraw, Treasurer; Joseph A. Gerardi, Secretary; J. E. Blackburn, Jr., Circulation Manager. Publication office: 99-129 North Broadway, Albany, 1, N. Y. Editorial and Executive Offices: 330 West 42nd St., New York, 18. District Managers and Branch Offices: Fred G. Hudson, 520 N. Michigan Ave., Chicago 11; 738-9 Oliver Building, Pittsburgh; J. W. Otterson, 68 Post St., San Francisco, 4; Aldwych House, Aldwych, London, W. C. 2, England; Washington; J. M. Spackman, New York; A. B. Cozzens, Philadelphia; E. E. Duff, Jr., Cleveland; B. F. Horn, Detroit and Chicago; Richard Y. Fuller, St. Louis; R. N. Phelan, Los Angeles; J. I. Ballard, Boston; Ralph Maultsby, Atlanta, Ga.

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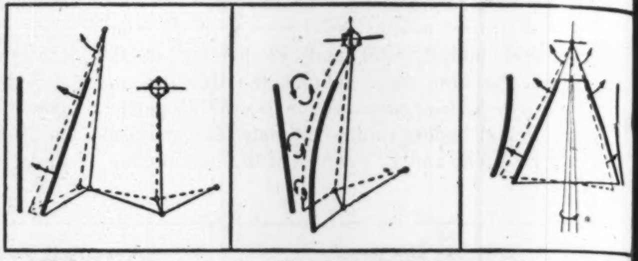
YOUR NEXT CRUSHE

WILL IT HAVE THESE FEATURES?

Crushing Without Abrasion • Perfect Balance • Big Reduction Ratio • Large Capacity per Horsepower • Sealed, Dirt Free Lubrication • Simple, Positive Safety Device

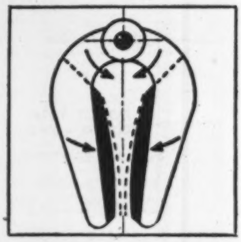
As these are exclusive features of KUE-KEN *balanced crushers, the answer can only be*
if your next crusher is a KUE-KEN

At the right we show motions of ordinary crushers, all having one point in common, with one *stationary* and one *movable* crushing member. The movable member moves toward the stationary member and, at the same time, moves *up* or *down* according to the type of crusher. Now see what happens when rocks are fed into these crushers. The movable member starts squeezing the rocks, and also moving up or down, causing terrific rubbing or abrasion. This is why these ordinary crushers wear out jaw plates so fast and waste so much power.



Blake type motion *Overhead eccentric type* *Gyratory type*

Now see how the KUE-KEN crushing principle eliminates this destructive abrasion or rubbing. The KUE-KEN balanced crusher has *two movable* crushing members hinged at the top. This motion is shown at the right. The balanced crushing members move towards each other in unison *without relative up or down* movement. Rocks are crushed by pure pressure. There can be no rubbing or abrasion. This is why KUE-KEN uses far less power and jaw plates last five to ten times longer than in ordinary crushers.

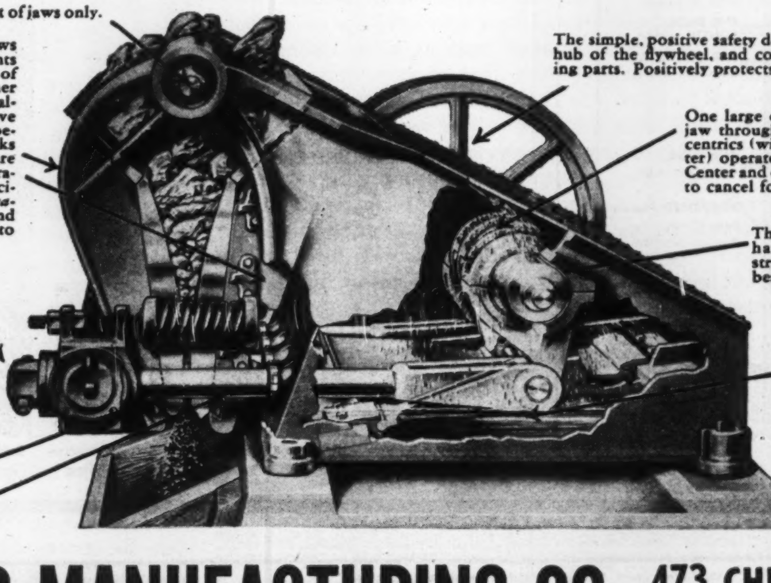


Hinge pins support weight of jaws only.

Two long symmetrical jaws hinged at the top. All points travel downward in an arc of circle as they move together in unison and perfect balance. As there is no relative up or down movement between the jaw plates, rocks are crushed by pure pressure without rubbing or abrasion. This exclusive principle of *crushing without abrasion* uses less power and makes jaw plates last five to ten times longer.

Accessible nuts are positively located on each side rod, locked in one position to prevent unequal adjustment. To change jaw opening, merely remove nuts and add spacers (furnished in various thicknesses), and replace nuts to locked position.

The exclusive **KUE-KEN** design of rear jaw plate lugs, which permits jaw plates to be worn entirely away without wear on jaw stock itself.



The simple, positive safety device is not visible. It is in the hub of the flywheel, and contains no shearing or break-ing parts. Positively protects crusher from tramp iron,

One large center eccentric operates jaw through toggles, and two outer eccentrics (with bearing area equal to center) operate front jaw through toggles. Center and outer eccentrics are 180° apart to cancel forces and balance mechanism.

The opposed and balanced mechanism eliminates crushing strains on the shaft and frame bearings.

In *addition* to the splash lubrication, cool oil is pumped from the large dust tight, sealed oil reservoir through an integral filter and then into the shaft bearings and toggles, giving perfect lubrication. A pressure switch automatically stops the crusher if oil supply should fail.

STRAUB MANUFACTURING CO.

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NGINEERING NEWS-RECORD

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tion Office: 99-129 North Broadway, Albany I, N. Y. • Editorial and Executive Offices, 330 West 42nd Street, New York 18

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WALDO G. BOWMAN, *Editor* **ALBERT E. PAXTON, *Manager***

132 APRIL 20, 1944 No. 16

MING NEXT

evident from present plans stwar highway construction any movable bridges will be d to carry out the program. 1941, when wartime restric- practically put a stop to this f bridge construction, many ements have been made in onal equipment, electrical s and safety control devices n be used to good advantage. ign problems involved in the this equipment and facilities reviewed in the May 4 issue.

requirements for vast quanti- topographical maps, and the ds used in making them, has to focus our attention upon ong neglected phase of civil ering. In the May 4 issue will blished an article on "plane s the transit" in which the presents some valuable in- on on the use of these instru- that will be of unusual in- Lower cost and greater ac- on many problems is claimed plane table.

in the May 4 issue, will be ed the first of several articles ly written for *ENR* by D. B. an, nationally known consult- gineer, on "Graphic Methods gineers." It is believed these as are new. Their use offer advantages in the field of ral design — as a means of m solving, an aid to visualiza- f basic concepts, and in the pment of new analytical pro-

KING AHEAD

roperly executed plan of pre- ve maintenance of electrical on construction equipment ult in a two-fold accomplish- Not only will it save the con- large sums of money, but it o be a real contribution to the ort in speeding up construc- rojects and in saving critical als. In an early issue will be ted some down-to-earth sug- s for establishing and operat- good plan of preventative elec- otor maintenance — what to when to do it under all pre- ved circumstances will be d for easy reference.

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Number of copies of this issue printed: 36,091

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To ....
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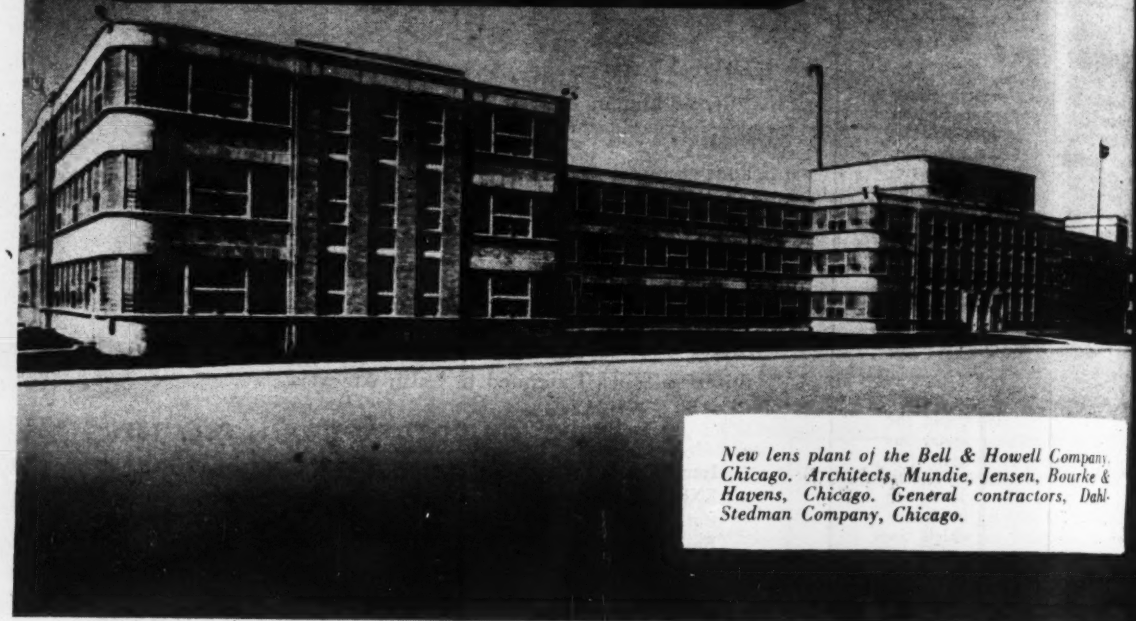
READY TO MAKE EYES FOR UNCLE SAM—

45 DAYS SOONER!



New lens plant of the Bell & Howell Company, Chicago. Architects, Mundie, Jensen, Bourke & Havens, Chicago. General contractors, Dahl-Stedman Company, Chicago.

Six weeks saved by Atlas High-Early cement in construction of lens plant

THIS new Bell & Howell Company plant, now turning out lenses for the Army and the Navy, started doing it weeks ahead of schedule, thanks to Atlas High-Early.

Construction work was started in the summer of 1942 by the general contractors, Dahl-Stedman Company of Chicago. This was a rush job, for Uncle Sam needed more lenses as quickly as they could be made.

That's why Atlas High-Early cement was used for the concrete work. According to Frank L. Hall, General Superintendent of Dahl-Stedman, its use enabled them to make a saving of approximately 45 days in construction time because forms could be stripped sooner than with normal portland cement.

Contractors throughout the country know they can depend on Atlas High-Early cement to save time and help them meet or beat construction schedules. They can strip forms sooner and reuse them more often, and secure usable concrete sometimes days ahead

normal schedules.

Before you start your next r

job, ask for more informati

about Atlas High-Early and

experience records on other jo

Write to Universal Atlas Ceme

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Corporation Subsidiary), Chr

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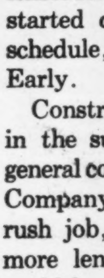

SAVE TIME IN WARTIME WITH

Atlas High-Early Cement

A UNIVERSAL ATLAS PRODUCT

The Week In Engineering and Construction

NGINEERING NEWS-RECORD • APRIL 20, 1944 • VOLUME 132 • NUMBER 16

Western builders organize to promote their industry

"Builders of the West" formed to coordinate war construction operations, create a reservoir of postwar projects and develop western resources

Initiating what its president termed he boldest and most extensive war d postwar project thus far underken by private intiative," an organition know as Builders of the West, ith headquarters in San Francisco, alif., was formed recently by leaders the construction and related indusies of the eleven western states.

Heading the organization whose primy objective is the creation of a giganc reservoir of postwar projects and e promotion of western industrializaon through the recovery of western esources," is F. B. Modglin, vice presient and general manager of MacDonld & Kahn, Inc., of San Francisco.

Mr. Modglin said it is planned to pen regional and field offices of Buildrs of the West in cities throughout he 11 Western states, and that a "subtantial sum" already has been raised mong members of the organization to ffset initial expenses of the organizaion. Modglin declined to state the ltimate amount the new organization xpects to raise, but reports have long een current among construction men hat the sum would approach $1,000,000.

During a recent press conference, Mr. Modglin would not identify Henry J. Kaiser, W. A. Bechtel Co., MacDonald & Kahn and other top-flight West coast construction firms as being the primary backers of the organization. In fact, he declined to name any of the members, stating that Builders of the West, in its present phase, is made up largely of men who are members of the Associated General Contractors of America and that they wished to have on their roster a list of names more representative of all types of industry before divulging the identity of present contributors to the organization.

At Kaiser headquarters in Oakland, a spokesman for the West's No. 1 builder said that the Kaiser Co. "is very much interested", but that as yet it has made no contribution.

Seven aims set forth

Some of the aims set forth for the organization are the following:

1. Gather all available information in one centralized organization covering war construction and all postwar construction plans formulated or proposed up to date.
2. Disseminate, accurately and fully, postwar construction information to the public at large.
3. Establish offices, adequately staffed, to carry forward the program in each region of the eleven western states.
4. Assist, consult and advise private and public agencies to facilitate the completion of engineering studies and plans through the blueprint stage, and to aid in securing rights-of-way and other properties requisite to the prompt start of construction.
5. Develop means of financing projects of every meritorious kind and nature, both public and private.
6. Perpetuate the private enterprise system and its attendant opportunities for the American worker, as opposed to relief.
7. Cooperate with and aid all groups concerned with the problems of industry and employment following the close of the war, including federal departments, and such groups as the Western Conference of Governors, various state commissions on interstate cooperation, and similar bodies.

To carry out the aims of the organization, the board of directors has employed Rex L. Nicholson, until recently Western Regional Director for the Federal Works Agency, as managing director.

Officers of Builders of the West, besides Mr. Modglin, are: Vice presidents, James Roberts, San Francisco; H. C. Golden, San Diego; secretary, E. S. McKittrick, Los Angeles; treasurer, William C. Tait, San Francisco. On the

(Continued on page 72)

The Navy makes civilian service awards

U.S. NAVY BUREAU OF YARDS AND DOCKS
MERITORIOUS CIVILIAN SERVICE

About 3,800 civilian construction workers have received the Award for Meritorious Civilian Service given by the Navy's Bureau of Yards and Docks since this form of recognition was established last August. The award consists of a small silver lapel button with a white Victory V and bronzed oak leaves and acorns against a blue background. Civilian employees eligible are those who work for contractors under the direct supervision of the officers-in-charge of construction.

The latter appoint local Boards of Award consisting of one officer of the Corps of Civil Engineers as chairman, one administrative official, and two or more civilian employees of the contractor's organization. The board submits names to the appointing officer, who then selects nominees which he submits to the Bureau Board of Award established by the chief of the Bureau of Yards and Docks, who makes the award.

Recommendations for award are based on excellence in ten respects: initiative; resourcefulness and enthusiasm in furthering speed and quality; industry; cooperation; dependability and attendance; mechanical skill; skill in application of technique and procedure; maintenance of equipment; method and procedure improvements; and contributions to conservation of material and manpower.

Plans and activities of UNRRA still in the development stage

Relatively few American engineers will be required by the United Nations Relief and Rehabilitation Administration for work here and abroad.

Although the United Nations Relief and Rehabilitation Administration will need some engineers for its work in this country and abroad, the total number will be less than stated in some current reports. The number required overseas will depend somewhat on the rapidity with which European engineers emerge from prison camps or are released from the armed forces of those countries.

Most of UNRRA's engineering and construction planning will be carried out by its own technical divisions. Two of the most important of these are the division of industrial rehabilitation, headed by Anthony Fried of Czeckoslovakia, and division of health headed by James A. Crabtree, a physician loaned to UNRRA by the U. S. Public Health Service.

No engineers hired

Technical divisions of UNRRA have not yet hired any engineers. Their initial needs will be for engineers for specific missions abroad, as a forerunner to establish construction needs, against which to build up a backlog of materials and equipment.

In this connection, the liberated areas branch of the Foreign Economic Administration for a year and a half has been sending out engineering missions to make studies for the armed forces, which studies are available to UNRRA. Such engineers have been sent to Italy, Sicily and North Africa to make estimates of various needs, including engineering materials and supplies. These estimates, according to Alex Taub, chief engineer of the liberated areas branch, will be useful as a basis for determining the preliminary stockpiles to be built up for other countries, but each such country will need to be separately surveyed when the time comes to determine its requirements.

The liberated areas branch of FEA uses three different types of engineers—transportation, general, and specifications. The general group includes eight civil engineers on the staff in Washington, with additional ones available as consultants at a ratio of two consultants for each one engineer regularly employed. Production of power and sanitation are included among their specialities.

Concerning equipment, it is known that estimates have already been made by UNRRA as to needs for such things as chlorinators, and other sanitary supplies, but neither the numbers needed nor where items will be bought have been divulged.

Little construction

It is recognized by UNRRA and the Foreign Economic Administration that food, medicine and sanitation, clothing, and shelter are of foremost importance to relief. Construction, therefore, will proceed only as it directly or indirectly furthers one of these relief purposes.

Refugee camps will be one of the early construction necessities. One sanitary engineer will be sufficient to supervise sanitary work in a refugee camp for 5,000 persons.

Dr. Crabtree indicated that no reliable estimate of the need for sewerage and waterworks repairs can be made on the basis of population. A better approach, he says, would be to base computation on the known number of communities in a region, and assume that a certain percentage of those having public water supply and sewage disposal—possibly 25 percent, as a conservative estimate—will have plants that are broken down or need repair. This percentage, however, obviously will depend on the amount of devastation by the enemy, Dr. Crabtree said. The overall need for reconstruction of facilities also will depend on the extent of the devastation.

What is to be done by UNRRA also will depend on the amount of rehabilitation that has been carried on previously by the Army following closely upon the heels of the enemy, in the prosecution of the war, and what additional amount will have been accomplished during the transition period while the Allied Military Government is in control.

• • •

More war public works approved by President

President Roosevelt has approved 150 war public-works construction projects to be built under supervision of the Federal Works Agency at a cost of $16,000,000, of which federal funds represent about $12,250,000. Funds are available from a $115,000,000 FWA appropriation already made. (*ENR* Apr
p. 455).

The projects range from $10,000
with four estimated to cost over hal
million dollars each. They include
terworks, sewerage systems, hospi
schools, quarters for student war nu
and recreation centers for service m

Among the larger projects are the

The San Diego County unified sch
district in California has a $720,
school project to consist of three u
of four buildings each.

A 100-bed hospital at Hunting
Park, Calif., will be financed with
grant of $400,000 and local fun
amounting to $200,000.

A $790,000 waterworks and sewera
system for the Harris County, Tex
water supply district will provide a w
with pumping equipment, a 300,0
gal. ground storage reservoir, a pum
ing plant with chlorinating equipme
distribution system, and additions to t
present plant. The project is for a 1,2
acre residential area east and north
downtown Houston. A population
nearly 11,000 will be served.

A $759,500 sewage facilities proje
is scheduled by the Hampton Road
Sanitation District Commission at Ne
port News, Va. There will be abo
four miles of trunk sewer, gravity an
force mains, and a pumping statio
The area, where population has i
creased since 1940 from 79,000 to mo
than 100,000, is now served by outfa
sewers that discharge raw sewage in
the shallow waters of Hampton Flats.

• • •

G. W. Plaisted, Austin Co. vice president, dies

George W. Plaisted, 51, vice preside
and general sales manager of The Au
tin Co., died at Shaker Heights, Ohi
April 11. Mr. Plaisted was a native
Worcester, Mass., and had been asso
ated with Austin since 1916, when h
was graduated from the Worcester Poly
technic Institute. As a lieutenant in the
Civil Engineer Corps of the Navy during
the first world war, he introduced im
portant innovations in drydock con
struction at the Puget Sound Navy
Yard.

After serving as a regional vice presi
dent of the company at Seattle and vice
president for the Pacific Coast with of
fices in Oakland, Calif., Mr. Plaisted
was named vice president and general
sales manager in 1940, when he moved
to Cleveland. He was elected a director
of the company in 1941. Contracts cover
ing design and construction of some of
the country's largest aircraft and chem
ical plants, naval facilities and many
other projects were negotiated under his
direction.

Maj. Gen. Donald H. Connolly

Brig. Gen. Don G. Shingler

Brig. Gen. Stanley L. Scott

Russia Honors American Engineers For Supply Job

At the time of the Tehran conference, mier Stalin graciously acknowledged the S. role in supplying war materials and d to Russia by his statement that "With- American production the United Nations ld never have won the war." Last week particularized his appreciation by award- thirty-four orders and medals to officers d men of the Persian Gulf Service Com- nd, who were instrumental in placing the plies in Russia's hands (See Beating a th to Russia's Back Door, ENR Oct. 7, 1943, *520, and Mud, Bally Poles and Brick,* ENR *v. 4, 1943, p. 668).*

Notable among those honored were Maj. n. Donald H. Connolly, commander of G.S.C., who received the Order of Suvorov, cond Class; Brig. Gen. Don G. Shingler, chief of the Motor Transport Service of P.G.S.C., who received the Order of Suvorov, Third Class; and Brig. Gen. Stanley L. Scott, executive officer, P.G.S.C., who received the Order of Kutuzov, Second Class. All three are Engineer officers. Names of others receiving awards have not yet been released by the War Department.

General Connolly's career is well known to readers of this journal through the biographical sketch published Dec. 9, 1943 (vol. page 859). General Scott, it will be recalled, was Division Engineer of the Southwestern Division at Dallas from June, 1940, to March, 1942, when the huge prewar construction program was underway there. A graduate of West Point in 1916, he served with the Engineers in France and Germany from April, 1918, to July, 1919. Among General Scott's other tours of duty were three-year terms as district engineer at both Honolulu and Little Rock. General Shingler, a 1918 graduate of West Point, served in various Engineer districts and schools until 1931, when he entered on a three-year tour of duty in the Canal Zone. Then followed two years at the Fort Leavenworth General Staff School, after which he served as assistant engineer commissioner of the District of Columbia from 1936 to 1939. General Shingler was assigned to the U. S. Military Iranian Mission in October, 1941. He was thus among the first Engineer officers to go to Iran, and probably served there longer than any other member of the Persian Gulf Service Command.

Timber for construction is not on critical list

Despite unprecedented demand for mber products for crates and boxes r overseas shipments, informal urces report that more structural timr is being produced than is being ed. According to W. B. Greeley, sectary-manager of the West Coast Lumermen's Association, for example fteen to twenty million bd.ft., of 3-. and thicker construction items are eadily obtainable every week.

The emphasis that WPB has recently laced on the critical nature of our umber production relates wholly to -in. and 2-in. boards of which some 15 illion bd.ft., many times normal requirements, will be needed in 1944. In ontrast, WPB's list of materials available in excess of current needs includes timbers and 3 and 4 in. dimension lumber of Western Red Cedar, Cypress, Douglas Fir, Western Hemlock, Larch, Southern Pine and Redwood. Since, in pushing cutting of logs o get out the maximum amount of small dimension lumber, balanced operations automatically result in the production of the larger sizes, it is expected that the latter will continue to be available to meet if not to exceed demand.

With respect to Douglas Fir, it is usually considered that the average production from a log is 20 percent clear lumber; 20 percent select and structural dimension and timbers; 35 percent No. 1 dimension and timbers; 15 percent No. 2 dimension and boards; and 10 percent No. 3 dimension and boards. The 55 percent of the total, represented by 20 percent select and structural dimension and timber and 35 percent No. 1 dimension and timbers, represents the structural timber component out of which only a very small percentage can be converted into boards for crating and boxing.

Mr. Greeley accents this situation by pointing out that "the Douglas fir sawmills are not equipped to put all or even the major proportion of their cut into thin lumber. Practically all of our mills have been designed to produce a substantial proportion of "cutting" from 3-in. thicknesses up to timbers of large size."

"Before the war," states Mr. Greeley, "the Douglas fir lumber industry produced but 7 to 10 percent of 1-in. boards and about 20 percent of 2-in. dimension. War requirements have converted these schedules to probably 16 percent of boards, and 25 percent or 30 percent of 2-in. dimension. For the remaining 50-odd percent of our logs, the West Coast mills require a substantial proportion of 3-in. and thicker items, in order to maintain volume of production and average realization. A strong effort is now being made by the Central Procurement Agency and the Office of Price Administration to further increase production of 1-in. boards.

It may be possible to bring the cut of boards up to 25 or even 30 percent of our entire cut; but that is as far as our mills can go, without extensive installations of additional machinery. Hence the industry needs more orders for 3-in. and thicker construction items.

WASHINGTON HIGHLIGHTS

Grand Coulee Dam began its fourth year of operation in March with a rated capacity of approximately 820,000 kw. following installation in February of an eighth large generator. The ultimate capacity is 1,974,000 kw. The Bureau of Reclamation forecasts a 1944 production of between 5,000,000,000 and 6,000,000,000 kw.-hrs. or approximately the equivalent of the 1943 output of 5,700,000,000 kw.-hr. at Boulder Dam. The 1943 figure for Grand Coulee was more than 4,000,000,000 kw.-hr. More than 600,000,000 kw.-hr. of power was produced last January, which the bureau announced as a world record for a single plant in a single month.

The maximum price of shale and clay building brick produced in Ohio—smooth, sanded, and wire cut—has been increased three dollars per thousand over the prices of last June. An exception is for brick produced in Cuyahoga County. In announcing the increase, the Office of Price Administration said that demand for brick in Ohio exceeds production by the 16 manufacturers in the area.

The Office of Defense Transportation has asked the War Production Board to allocate 2,200,000 tons of steel for rails during 1944—an amount which ODT says the railroads may have difficulty in laying. This does not mean, an ODT spokesman said, that the railroads will have less labor than during recent months but, rather, that the increase in rails will aggravate the problem which is already acute. The railroads have added to their maintenance crews by use of Mexican labor, particularly in the west. The Pennsylvania Railroad expects to bring in about 500 Mexican laborers during April for maintenance work between Washington and New York City.

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With only two percent of the nearly 44,000 items of used construction equipment owned by contractors and distributors available for sale, and only four percent available for rental, the War Production Board is making a publicity drive to get contractors to keep the WPB register up to date as to status of used equipment. The purpose of the drive is to make idle machinery available for domestic needs.

It appears likely that in addition to a difference of opinion between equipment holders and the Office of Price Administration over a fair pricing method, the considerable amount of filing, registering and reporting required by WPB may have had its effect in detering contractors from reporting machinery.

Nearly a third of federal funds allotted for community facilities under the Lanham Act have gone into water and sewer systems.

Major General Philip B. Fleming, Federal Works Administrator, poi out that approximately $75,000,000 Federal funds has gone into water sy tems and $45,000,000 in sewer work.

"Hospital and health center constru tion has required $63,000,000," he add "school construction $61,500,000 a recreation $30,000,000. In all, fun have been allotted to about 3,000 co struction projects in war-impact are About 2,000 of these are already in u

As of Jan. 31, FWA had provided ap proximately $353,000,000 under th Lanham Act for 4,722 projects esti mated to cost $494,866,891. The remain der of the cost is made up in genera by the communities or areas served an by those making use of the facilities Cities and other local bodies have con tributed to the general FWA wartime community facilities program mor than $142,000,000, or about 30 percen

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So. California pipeline approved by WPB

War Production Board approval has been granted three southern Californi utilities companies to construct a $4,000,000 pipe line from La Goleta natural gas fields to Los Angeles, a distance of 150 miles.

The project, to provide 164,000,000 cu.ft. of gas for peak day use in the Los Angeles area, will be undertaken by Southern Counties Gas Co., Southern California Gas Co., and Pacific Lighting Corp., owner of the dry gas field

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Some municipal plans and projects

Salt Lake City, Utah—It has been announced by E. O. Larsen, district director, Bureau of Reclamation, that a contract will be let shortly for another unit of the Salt Lake City aqueduct, which will bring water from Deer Creek reservoir to the city.

Henderson, N. C.—The planning and development committee of the Henderson, N. C., Chamber of Commerce, has recommended that plans be made for a new and more adequate water supply for Henderson. The Rowland Pond reservoir, the city's present supply, is not considered adequate. The city was confronted with a critical water shortage last year because of a protracted drought.

Charlotte, N. C.—The city has begun preliminary surveys looking toward the expansion and modernization of its municipal water and sewerage system. New sewer outfall lines and additions to sewage disposal plants and pumping stations are considered.

Rochester, N. Y.—City Manager Cartwright is applying for a permit from the state water power and control division of the Conservation Department to expand the Hemlock-Canadice Lakes water supply system. The proposed plan would increase the two lakes' deliverable capacity of water, according to Robert E. Horton, the city's consulting engineer, from 31,000,000 to 40,000,000 gal. per day. The proposed work would include restoration of Conduit 1, replacement or relining of Conduit 2, construction of a new Hemlock Lake Dam near Hemlock Village, reconstruction of the present Canadice Dam and construction of a new Hemlock Lake gatehouse.

Baltimore, Md.—The city has taken the first step in the program to tap the Patapsco River to augment the water supply. The assured minimum yield daily of the Gunpowder watershed, as now developed, is placed at 148,000,000 gal. by the city's water experts. The average daily consumption last year was 165,000,000 gal.; in January it was 172,000,000 and is expected to rise further.

A temporary program is to be financed under a $12,500,000 water loan approved by the voters in May, 1943. It will cost about $5,700,000. Less than half of this will go for installations that eventually can be fitted into the permanent program. City engineers say that the job will give Baltimore 45,000,000 gal. of water a day. This, together with the safe yield of the Gunpowder, would exceed the present consumption.

Dallas, Tex.—City manger V. R. Smitham has authorized immediate steps to prepare for the construction of a 150-ft. inner-boulevard loop, circling the center of Dallas. Public Works Director Tom Conroy is working on drawings, and it is expected that the right-of-way will be obtained as soon as these preliminary plans are completed.

eady rise in highway accidents ported at New York conference

rictions on truck and automobile use caused only a temporary ne in traffic accidents. Greater increase anticipated.

sconcerting increase in traffic s and some indications that the rate will rise sharply when strictions on motor vehicle use ted were reported at a high- affic conference held in New n April 14 under the auspices Eno Foundation for Highway Control. The rise in accidents s to be due to the loss of skilled control officers to the armed and to war industries, also to creasing age of car, trucks and now on the roads. Some of it e due to fatigue of war workers uck drivers.

conference was opened by s M. Upham, engineer-director American Road Builders Asso- and a vice president of the Eno ation. After the war, Mr. Up- aid, it will be some time before orn-out vehicles can be replaced, e traffic volume will spurt ahead n as fuel restrictions are lifted. while, streets and highways will deteriorated, which will produce bination of factors favorable to p upturn in accidents. This, Mr. n said, will place an unprece- d problem before highway admin- rs, traffic engineers and enforce- officers.

More safety in design

rold F. Hammond, president of Institute of Traffic Engineers, the designers of postwar high- to build more safety into their ns. This can best be done by hav- ll designs checked by traffic en- rs familiar with operating prob- In urban areas, Mr. Hammond mmended greater use of one-way ts and more restrictions on left on main thoroughfares, greater tion to the origin and destina- of the traffic to be accommodated, channelization and intersection rol, and better facilities for pedes- s.

ke views were expressed by Hal ours, director, Ohio Department of hways, especially with respect to cooperation between designers traffic officers.

r. Sours cited widening of old l highways as a means for greatly easing safety at relatively low cost. ever, he opposed major widening old city streets to increase their acity as being much too costly for the results obtained. He recommended the construction of limited-access express route for that purpose. By-pass routes, he said, can sometimes be used to advantage to syphon off traffic from city streets.

Coordinated control

G. Donald Kennedy, vice president of the Automotive Safety Foundation said that the Highway Traffic Advisory Committee set up by the War Department has made a notable contribution not only to the war effort but to postwar highway safety through the coordination of the work of all state traffic and highway agencies that has been inaugurated under its auspices.

On the subject of educating the public to demand safer highways, Mr. Kennedy said that the best form of education is to give the public concrete evidence of what a safe and efficient highway can be. He cited the Detroit Expressway as an example of a modern highway giving complete freedom of movement through a densely built-up area.

Burton W. Marsh, director of the traffic engineering and safety department of the American Automobile Association, told the conference of the current rise in traffic accidents. The volume of traffic has declined since 1941, he said, and fatalities also declined for a time, but accidents now are on the uptrend though there has been no corresponding increase in traffic volume. Traffic speeds also are on the uptrend. Speeds declined sharply under the ODT restrictions of 1942, but they have been inching up in recent months.

The afternoon session of the conference was given over to a panel discussion of traffic enforcement problems.

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A.W.W.A. conference has big early registration

Almost 1,000 advance reservations for hotel space already have been made for the conference of the American Water Works Association to be held in Milwaukee on June 13-16. In releasing this information, Harry E. Jordan, secretary of the association, urged that inquiries for accommodations be addressed to the Milwaukee Association of Commerce rather than to specific hotels in order to facilitate arrangements.

One of the most important sessions to be held, stated Mr. Jordan, will relate to a discussion on the cost and useful life of waterworks structures. Also highlighted on the program will be the appearance of Col. W. M. Carey, chief engineer of the Federal Works Agency, who will outline plans for postwar construction.

Speakers at the opening session of the Eno Foundation Conference on street and highway traffic problem. Left to right, Burton W. Marsh, director, traffic engineering and safety department, American Automobile Association; Hal G. Sours, director, Ohio Department of Highways; L. A. Hince, Federal Bureau of Investigation; Charles M. Upham, engineer-director, American Road Builders Assn.; Harold F. Hammond, president, Institute of Traffic Engineers.

JOBS OF THE WEEK

PERSONNEL BUILDINGS, Shoemaker, Calif.

Bureau of Yards & Docks, Navy Department, Washington, D. C., awarded a contract for additional personnel buildings to Guy F. Atkinson Co., San Francisco, at $1,184,080.

PLANT, Bellingham, Wash.

Puget Sound Pulp & Timber Co., Bellingham, awarded a contract to build a plant to produce ethyl alcohol from waste sulphite liquor to Howard S. Wright, Seattle. The estimated cost is $1,000,000.

REFINERY, Los Angeles, Calif.

Richfield Oil Co., plans a refinery. A contract for construction has been let to The Lummus Co. of Los Angeles, at $514,500.

VETERANS HOSPITAL, Roanoke, Va.

Charles H. Tompkins Co., Washington, D. C., was the lowest bidder when the Veterans Administration, Washington, D. C., opened bids for additional buildings and utilities at Veterans Hospital, at $1,557,000.

TEST CELLS, Middletown, Pa.

U. S. Engineers, Middletown, received the lowest bid for constructing test cells at Middletown Air Depot from John W. Ryan Construction Co., Inc., New York, N. Y., at $519,780.

DWELLINGS, Inglewood, Calif.

Halper Construction Co., Los Angeles, Calif., has been awarded a contract for the construction of 375 dwellings for Lee-Hal Inc., Los Angeles. The estimated cost is $1,300,000. S. Charles Lee, Los Angeles, Calif., is the architect.

ORDNANCE WORKS ADDITION, Baraboo, Wis.

U. S. Engineers, Milwaukee, Wis., awarded a contract for the design and construction of an addition to the Badger Ordnance Works to Mason & Hangar Co., Inc., New York, N. Y. The estimated cost is $17,000,000.

NAVAL BUILDINGS, San Bruno, Calif.

Bureau of Yards & Docks, Navy Department, Washington, D. C. awarded a contract for constructing buildings for personnel depot, including barracks classrooms, drill hall, gymnasium, swimming pool, library, chapel, post office and bank building, at Tanforan Race Track to Goodenough-Geyer, Palo Alto, at $1,536,670.

HEATING PLANT AND LABORATORY, Langley Field, Va.

Civil Aeronautics Authority, Washington, D. C., awarded a contract for west area heating plant to Rust Engineering Co., Pittsburgh, Pa., at $837,480; electric aircraft instrument laboratory to F. D. Rich, Inc., New York, N. Y. The estimated cost is $504,367.

ROAD SURFACING, Virginia.

Department of Highways, Richmond, Va., received the lowest bid for furnishing, delivering and applying hot bituminous, asphaltic concrete and sand asphalt surfacing on various state highways. Among the low bidders were Sam Finley, Inc., Roanoke, Va., at $1,062,835 and J. R. Ford, Inc., Lynchburg, Va., at $1,106,347. The total cost of the project is $3,837,819.

LEVEES, Oklahoma.

U. S. Engineers, Tulsa, Okla., awarded a contract for 7.9 mi. levees, seven stop log structures, two pumping stations, on the Arkansas River to Jones Construction Co., Emporia, Kan., at $610,497.

APARTMENT BUILDINGS, Kansas City, Mo.

Fairfax Hills, Inc., Kansas City, Mo., awarded a contract to build 49 apartment buildings to S. Patti Construction Co., Kansas City, Mo. The estimated cost is $2,000,000. George Metz, Wichita, Kan. is the architect.

BARRACKS, Miami, Fla.

U. S. Engineers, Miami, barracks, messhalls and extensions of utilities at Miami Master Airport and Naval Air Station, Miami to Hillyer & Lovan, Jacksonville. The estimated cost is $510,000.

Note—Additional bidding and contract news on many projects large and small appear in the Construction News section beginning on page 303.

Western builders

(*Continued from page 67*)

executive committee are Arthur At ton, Seattle; A. Teichert, Jr., Sa mento; A. S. Vinnell, Los Angeles, Charles L. Harney, San Francisco.

All of the present officers are pr nent West Coast contractors, but Modglin emphasized that as the org zation expands the executive heads be changed until the group becom representative of all types of indus supporting the program, rather than the contracting industry alone.

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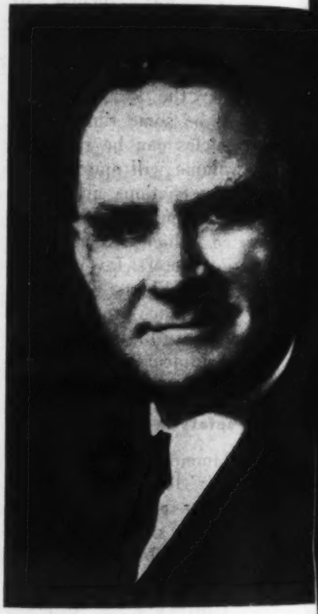
Col. J. Monroe Johnson new head of the ODT

On April 4 President Roosevelt a pointed Col. J. Monroe Johnson of Sou Carolina to be director of the Office



Defense Transportation to succeed the late Joseph B. Eastman.

Colonel Johnson is a member of the Interstate Commerce Commission, as was Mr. Eastman, and while it was not made immediately clear whether the new ODT director would retain his ICC post, it was presumed that he would, since Mr. Eastman held both positions. Brig. Gen. Charles D. Young has been serving as acting director of ODT up to this time.

The new director is 65 years old and a civil engineer. He served as a volun- teer in the Spanish-American War in 1898 and rose from major to colonel.

He was chief engineer of the Rain- bow Division overseas in the first World War.

OBITUARY

John H. Sheffel, 48, a World War I eteran and junior assistant civil engi- eer in the Rochester, N. Y., engineer- g department, died April 9. Mr. heffel had been with the department ver 26 years.

John H. Friedrich, 68, chairman of e Branch County road commission, ied March 29 at Coldwater, Mich.

William Young Abresch, 64, of Gas- nia, N. C., died April 2. For the past ree years he was city building in- pector.

Charles H. Garity, 58, Tennessee Val- y Authority director of materials, died Chattanooga April 5. Mr. Garity had en with the authority since its start in 33.

Thomas Marvin Torson, 75, died ril 6, in Long Beach, Calif. Mr. rson had lived in Kansas City, Mo., 60 years until a few months ago, en he went to California. He was engineer and sewer contractor. The wall at Long Beach was one of his gest projects.

Samuel P. Knight, 54, Kittery, Me., d commissioner for the last 20 years, d April 6. He headed a contracting npany widely known in that section.

Ralph M. Davis, 78, retired building tractor, died April 5 in Greensburg,

Frank Percy Jennings died in Mont- l, Que., April 2. He was engineer in rge of works of the Halifax Dock- ds during the last war, and later s with the Department of Marine d Fisheries at Ottawa. He built many hthouses on the coasts of Canada.

George W. Habley, 74, died at Louis- e, Ky., April 8. In 1918 he became ministrative engineer and chief of servation of the U. S. Fuel Adminis- tion in Kentucky and was consulting gineer of the State Board of Charities Corrections from 1920 to 1924, and the public utilities bureau till 1935.

Walter J. Jerz, 46, senior construc- n inspector of structural engineering Detroit, died April 11.

William Garforth Stone, 94, India- n civil engineer and a major in the S. Army in the first World War, d at Baltimore, Md., April 11. He planned much of Virginia Beach, Va., the Woodlawn cemetery in Baltimore, and the military facilities at Fort Benjamin Harrison, Ind.

Otto Loren Hill, 59, city engineer of Bedford, Ind., and former county surveyor, died April 4.

Samuel David Matthews, 86, retired building contractor of Hamilton, N. C., died Mar. 24.

F. E. Wester, 57, for many years a prominent building contractor at Marquette, Mich., died Mar. 19.

Richmond Jasper Horton, 88, building contractor of Dallas, Tex., died there Mar. 17. He was a native of Michigan, and he built many early Dallas buildings and developed a city addition some years ago.

Irba Thaxton O'Mara, 50, former engineer of Houston, Tex., and designer and construction supervisor of the sunken garden at Houston, died at Hines, Ill., Mar. 10.

James Franklin Randall, Sr., 71, veteran contractor of Houston, Tex., and at the time of his death, associated with the Tellepsen Construction Co., died Mar. 24.

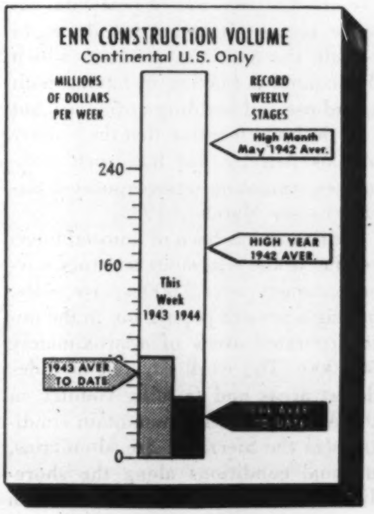
News of the Week
Continued on p. 229

CONTRACTS AND CAPITAL

CIVIL ENGINEERING construction volume in continental U. S. totals **$51,425,000** for the week. This volume, not including the construction by military engineers abroad, American contracts outside the country, and shipbuilding, is 56 percent higher than in the preceding week, but 38 percent lower than in the corresponding 1943 week.

Private construction tops last week by 115 percent, and is 120 percent above last year. Public construction gains 49 percent over a week ago, but is 45 percent under a year ago as a result of the decrease in federal work.

The current week's construction brings 1944 volume to **$568,425,000** for the sixteen weeks of the period, a decrease of 51.5 percent from the **$1,171,009,000** reported in 1943. Private work, **$117,820,000**, is 4 percent lower than in the period last year, and public construction, **$450,605,000**, is 57 percent lower due to the 11 percent decline in state and municipal work and the 59 percent drop in federal volume.



In the classified construction groups, gains over last week are in waterworks, bridges, industrial, commercial and public buildings, earthwork and drainage, and highways. Increases over the 1943 week are in waterworks, bridges, industrial and commercial buildings, and highways.

New capital for construction purposes for the week totals **$133,541,000**. It is made up of **$2,698,000** in state and municipal bond sales, **$15,843,000** in corporate security issues, and **$115,000,000** in federal appropriations for FWA construction. New construction financing for 1944 to date, **$364,638,000**, is 22 percent below the **$468,845,000** reported for 1943.

CONTRACTS

Continental U. S. Only
(Thousand of Dollars)

	Week Ending Apr. 22 1943	Week Ending Apr. 13 1944	Week Ending Apr. 20 1944
Federal	$77,629	$27,292	$37,032
State & Municipal	1,920	1,928	6,454
Total public	$79,549	$29,220	$43,486
Total private	3,616	3,695	7,939
TOTAL	$83,165	$32,915	$51,425

Cumulative
1944.......(16 weeks)......$568,425
1943.......(16 weeks).....$1,171,009

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1943 16 Weeks	Cumulative 1944 16 Weeks
NON-FEDERAL	$68,495	$158,806
Corp. Securities	2,821	69,319
State & Mun.	61,041	35,707
RFC Loans	1,500	53,780
FPHA Loans	3,133	.....
FEDERAL	$400,350	$205,832
TOTAL CAPITAL	$468,845	$364,638

ENR INDEX NUMBERS

Index base=100		1913	1926
Construction Cost	Apr. '44	297.70	143.10
Building Cost	Apr. '44	234.50	126.76
Volume	Mar. '44	103.	45.

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

Airport Bearing Tests

Sir: The article "Simplified Tests for Soil Bearing Pressure" in *Engineering News-Record*, Jan. 27, 1944, Vol. p. 136, makes available much interesting information. Unfortunately, the wrong impression may be created by one statement. The caption for Fig. 1 reads, "Bearing test equipment used at Fort Dix can be set up quickly. It permits rapid work with a small crew. Note freedom of movement permitted the workmen."

From this caption it is implied that the picture was taken at Fort Dix, whereas it was obtained on or about Sept. 5, 1942, at the Dover Airbase while personnel of the U. S. Engineers and the Delaware State Highway Department were making load bearing tests at that field. The Division of Tests of the department had been requested to assist in making these and other tests, and the manner in which trucks were used in the performance of these tests was developed by their personnel.

For the load bearing tests performed at the Dover Airbase, during the month of September 1942, an average of one complete test location was finished every 3½ hr., even though rain was encountered and locations were tested in rebound as high as ten times.

M. Allan Wilson,
Testing Engineer,
Delaware State Highway Department,
Dover, Del.

Good Specifications Are Written

Sir: In an editorial on specifications in *Engineering News-Record*, Jan. 13, 1944, p. 24, the question is raised are there any good specifications. As one who has several times lately criticised specifications in public print, I would like to offer the following comments:

Of course, good specifications are written. However, the bad ones appear to be in plurality, particularly among old government agencies that have gone stale, due to their respective large Washington headquarters determining policies without knowing the field conditions existing in the various parts of our vast country.

I know of two agencies that have put out splendid specifications, the Tennessee Valley Authority and the New York City Board of Water Supply. Both of these agencies have proved to be fine engineering organizations, probably primarily because they were autonomous and free from Washington interference and red tape. Also, the high quality of TVA specifications may be due to a large extent to the firm foundation for it laid down by an engineer schooled in that splendid organization led by J. Waldo Smith in the New York City Board of Water Supply.

So perhaps, these things are inherited from engineer to engineer. Perhaps, that fine engineer who happened to teach this writer in the art of specification writing, was correct when he said:

"Select yourself a good boss, and then work like hell."

Rolf T. Retz
Hampton, Va.

A Versatile Department

Sir: In your issue of Jan. 27, 1944, p. 90, a news account concerning a building code adopted by Marion County, Indiana, was of particular interest to me. It is not my desire to belittle the excellent progress which this county is making in having both a land-use and building ordinance, but I do desire to mention that the County of Los Angeles has had such ordinances regulating unincorporated territory since March of 1933.

Our work has been of unusual interest due to the enormous territory covered, namely, over 3,000 square miles, having a present population in the unincorporated areas of approximately 500,000. The work covered includes desert areas and farming country in the Antelope Valley, mountain conditions in the Sierra Madre Mountains, unusual conditions along the shoreline where many houses are built on piling, as well as heavily congested areas adjacent to the City of Los Angeles itself.

The department has been unique among larger departments in that each inspector is required to have an engineering background and makes inspections of building, electrical and plumbing installations, thus eliminating calls by two additional inspectors on each job. It operates on a self-supporting basis, with fees slightly below some of the surrounding municipalities. Volume of work load amounts to approximately one-half that of the City of Los Angeles, and for many months ranked among the top five building regulating departments in the entire country. Present personnel is about fifty, and the building code used is the Uniform Building Code developed by the Pacific Coast Building Officials' Conference.

Best wishes to other counties regulating land use and building construction.

Cassatt D. Griffin
Acting Chief
Department of Building and Safety
County of Los Angeles
Los Angeles, Calif.

Flood Control Work as War Construction Training

The following is extracted from a letter relating to the present responsible positions of Army Engineer officers overseas who were active on flood control construction here at home in the years prior to the war, which was published in the March 6 issue of the Congressional Record:

The Honorable Dewey Short,
House of Representatives,
Washington, D. C.

Dear Congressman Short: We are using to great advantage the Engineer officers we have been training through the years on waterways and flood-control work. Most of the business side of the war effort overseas, as well as many of the command positions, is under the guidance of these Engineer officers who learned through positions of real responsibility how to manage men and equipment against time and the elements—the essentials of logistics—either in war or in peace.

It is natural that commanders have turned to such men as generals Somervell, Styer, Gross and Clay there at home, not to mention generals Reybold and McCoach, as well heeler in India, Connolly in the lle East, Crawford in Egypt and here with us, Larkin in north ca, Pence in Italy, and more than ore here in the E.T.O. with me, to name a few: Lord, Stratton, echt, Plant, Vaughan, Grower Broshous, all on command or rtant general staff duty; not to ion Moore, our Chief Engineer, Hardin, Berrigan, Luplow, ng, Chorpening, Newman, Lock, nson, Talley, and others on engi- ng, not only with the ground and orces but with our service forces ell.

ery one of us was trained on table engineer work between the periods, gaining experience and ring to undertake any duty that gentlemen of the Congress had s. It is the greatest comfort to hat I can turn to these officers confidence and assurance that jobs will be better done than I do them myself. This proves isdom of your policy.

John C. H. Lee,
Major General, United States Army,
Deputy Theater Commander.
European Theater of Operations

bees on Guadalcanal

: In connection with the article e Navy's Seabees in the Feb. 24, issue of *Engineering News-Rec-* he enclosed photo may prove in- ing. It shows all the officers of h Battalion of Seabees, who were uadalcanal.

ated in the center is Lt. Comdr. lon. (now commander). Standing in the back row, 5th from the left is my son, Ensign Arthur Kohn, (now lieutenant, junior grade). I am not familiar with all the others and would hesitate to name any of them.

L. Kohn,
General Manager,
Fleming Steel Co.,
New Castle, Pa.

Failed to Credit the Navy

Sir: To my great surprise when I read "Submarine Water Mains Built in Deep Water" published in *Engineering News-Record*, December 2, 1943, p. 816, I found no credit given to the public works department of the First Naval District, U. S. Navy. This project was promoted by the Portland, Me. public works office, the funds obtained from the Federal Works Agency on an application by the Portland Water District, and sponsored in Washington by the chief of the Bureau of Yards and Docks. When the consulting engineers, appointed by the Portland Water District, submitted plans involving pipe and specially designed fittings, impossible to obtain under existing WPB regulations, the public works office of the First Naval District again stepped in and redesigned the project for wrought iron pipe and proposed the flotation method of placing described. (For the information of your readers the pipe filled with air has a buoyancy of 2 lb. per lin. ft.) Furthermore, the Navy made the 12-in. pipe available to the Portland Water District through one of its Portland contracts.

rs of 6th Battalion of Seabees, who were on Guadalcanal.

In giving credit for the work the following should also be mentioned: Admiral Ben Moreell, chief of the Bureau of Yards and Docks; Admiral W. T. Tarrant, commandant, First Naval District; Captain (then commander) H. E. Wilson, public works officer, First Naval District, and Commander (then lieut. comdr.) A. G. Hillberg, resident public works office at Portland.

Comdr. A. G. Hillberg, (CEC) USNR
Hq. V Amphibious Corps
Somewhere in the Pacific

Concrete at Norfork Dam

Sir: In the article on Norfork Dam construction in *Engineering News-Record*, Feb. 10, 1944, Vol. p. 187, two items that appear to be misleading are as follows:

The caption of Table I reads "Typical 4-Bag Mix of Mass Interior Concrete," whereas it should read "Typical 4-Bag Mix of Mass Exterior Concrete." Table II reads "Typical 3-Bag Mix of Mass Exterior Concrete," whereas it should read "Typical 3-Bag Mix of Mass Interior Concrete."

On p. 192 a sentence in reference to absorptive paper states "The latter eliminates the need for rubbing the concrete." It is true that the absorptive paper does not create a surface pleasing appearance, but the prime purpose of the paper is to eliminate surface pits and voids, and to render a "case-hardened" surface highly resistant to weathering actions.

Maj. H. E. Murray, *Assistant*
Corps of Engineers,
Little Rock, Ark.

Errors in a Book Review

Sir: My review of Professor Binder's book "Fluid Mechanics" as printed on p. 493 of the April 6 issue of *Engineering News-Record* contains two disturbing errors, which require correction.

In the third paragraph the Gibson salt velocity method is mentioned. The words "salt velocity" did not appear in my manuscript, do not belong in the text and should be omitted.

In the last paragraph the word "national" should read "rational."

Eugene E. Halmos,
Consulting Engineer,
New York, N. Y.

EDITORIALS

VOLUME 132 • NUMBER 16

April 20, 1944

To Keep Your *News-Record* Coming

AS A SUBSCRIBER to *Engineering News-Record* there is one war waiting list you can readily avoid. This is the list of those who have placed orders for *ENR* subscriptions and who cannot be immediately accommodated because government paper conservation measures have frozen our circulation total at its present level. Although this total is one of the largest in history, the waiting list nevertheless contains three or four times as many names as are being dropped each month, and we can only enter new subscriptions as fast as old subscribers drop out. Much as we regret it, there is nothing we can do for those on the list except ask them to wait, but present subscribers can avoid being in the same position if they will simply renew their subscriptions promptly. If your renewal is received too late, your name automatically goes on this waiting list, and, unfortunately, at the bottom. Recognizing that renewal dates are easily forgotten, our circulation department mails a series of five reminder letters, the first to come to you 60 days before the expiration of your subscription, and the others to follow at two-week intervals, the last being mailed on the expiration date itself. Then, if your renewal is not received within two weeks, must come the painful process of changing your status from "subscriber" to "former subscriber". And the only way back is to climb up the list. Therefore, please renew your subscription on time to keep your *News-Record* coming.

Construction Timber Plentiful

SEVERAL WEEKS AGO we published a news item and an editorial relating to the tremendously increased war demands for crating and boxing lumber, which, coupled with labor shortages in the forests, was making timber the No. 1 critical material for construction. Fortunately, the situation is nowhere near as serious as the information we had then seemed to indicate. Indeed, both WPB and the West Coast Lumbermen's Association are on record as stating that timbers and planks 3 in. and thicker are available in excess of current essential needs. Even more significant is the fact that an increased use of construction lumber is desirable to stimu the production of the much needed 1-in. and 2 material for crating and boxing. This, of course, because a given log is never cut into all board or structural timber; economy dictates a "balanc cutting which produces both, and in several gra and sizes. Moreover, the sawmills of the No west are not equipped with machinery that make over 30 percent of a log into boards, though economy were no object. The result is 15 to 20 million bd. ft. of structural timber is av able weekly. No construction job, therefore, ne to be deferred because of lack of timber, and prosecution now, in fact, will help to increase p duction of boards for crating and boxing.

Falling Walls

SIX PEOPLE WERE KILLED in Ft. Wayne, Ind., week when a five-story wall of a building gutted a month-old fire was toppled by a high wind thro the roof of an adjoining bank building. A fr accident? No, an invited one! All too often wre of fire-scoured buildings are left standing pend insurance settlement, remaining as hazards and e sores even though obviously they must be razed the ground before rebuilding takes place. La codes and inspectors protect the public whe building is erected. Why cannot these same p tective measures be applied when the building on its way down? Charred walls that topple w the wind have no place in the American scene. L pull them down before they fall down.

Ponton or Pontoon

CAREFUL READERS OF THIS JOURNAL will note the floating supports for an emergency bridge by Army Engineers are called "pontons," w somewhat similar floating supports used by Navy are called "pontoons". This is not the re of careless editing; it is done simply to conform the practice of engineers of the Army and N with respect to a term that both use, but on spelling of which they do not agree. The Ar Engineers cling to the French spelling, many their traditions and practices having come from French. The Navy, on the other hand, looks to British Navy for its traditions and so prefers anglicized spelling — pontoon. Thus, if b the Army and Navy are to be satisfied, the Ar Engineers must be permitted to cross rivers ponton bridges and the Navy Seabees to br equipment ashore on a pontoon landing stage.

strial Wastes—The City's Problem

AM POLLUTION ABATEMENT will command r attention in the postwar period, and not the challenging of its aspects will be that relating e treatment of industrial wastes. What are the onsibilities of industry in this regard, and what he obligations of the community in which it is ed?

is not realistic to presume that industry alone ld and must provide the means for the disposal wastes; this is neither practical nor expedient, overlooks the fact that industry has a claim on in community services. On the other hand, no stry can justifiably expect that a municipality bligated to provide without cost special facilities he treatment of any waste that may be dis- ged into its sewers.

here is opportunity, however, for both parties to erate, precedents for which already exist. For ple, in Greensboro, N.C., the local textile mill ributed to the cost of a municipal disposal plant hich provisions were made to treat mill wastes with domestic sewage. And in Cedar Rapids, he meat packing industry paid for the installa- and operating costs of pretreatment facilities ed adjacent to the municipal disposal plant designed specifically to make packinghouse es amenable to subsequent treatment with estic sewage.

e most recent approach to handling industrial es in a municipal plant is provided by New swick, N. J., as reported on p. 554 of this . In that city it was found that operating costs he sewage disposal plant had doubled due to e discharges from war industries. Properly rding this extra cost as an unjustified burden e taxpayers, the city has promulgated a special ce charge for industries based on a three-part schedule. The latter—basing the charges on me of flow, solids content and chlorine demand ch type of waste—represents an unusual and endable effort to provide a fair measure of "load" contributed by individual industries.

unicipal engineers and officials charged with responsibility for postwar thinking cannot e the problem of industrial waste disposal. e new treatment plants are under considera- they should be designed with due regard for mmodating industrial wastes; and existing municipal plants should be examined as to possible revamping so that they, too, can handle contributions from industry. Stream pollution abatement will be advanced only so far as we are able to minimize industrial waste as well as domestic sewage discharges.

Design Begins Below the Surface

ONE OF THE MOST IMPORTANT of the many requirements of planning and designing postwar construction projects is accurate knowledge of the site—particularly from the surface down. Not only does lack of such knowledge invite trouble with the completed structures, but the discovery of unexpected ground conditions invariably causes changes in design or construction methods that delay the job and increase its cost. Much of the uncertainty, delay and expense may be eliminated if the facts concerning the underground conditions are fully known in advance.

Construction in water-bearing ground particularly calls for extensive investigation in advance of detail planning so that the most economical method of construction can be selected. A knowledge of the underlying strata, down to thick, impermeable layers below the proposed improvement is the least that can be considered adequate. Moreover, on large undertakings it is important that sufficient appropriation of funds be made for such subsurface investigations at each possible site. Such investigation might profitably include some test pumping as well as more and deeper test borings than have been customary heretofore. In some cases alternative designs might well be made, each planned to accommodate a different basic method of construction that may be preferred by the different bidders.

Such thoughts as these cannot help but occur to any reader of the articles on the various techniques for dewatering subsurface strata published in this issue and in that of April 6. Since Robert Stephenson introduced dewatering to aid in the construction of the Kilsby Tunnel on the London & Birmingham Railroad in 1838, great progress in this practical science has been made. Better understanding of the available means of dewatering, whether for open-cut or tunnel work, can reduce construction cost and shorten construction time on many a postwar project. It may even make some otherwise questionable projects practicable.

NEERING NEWS-RECORD WALDO G. BOWMAN, *Editor*
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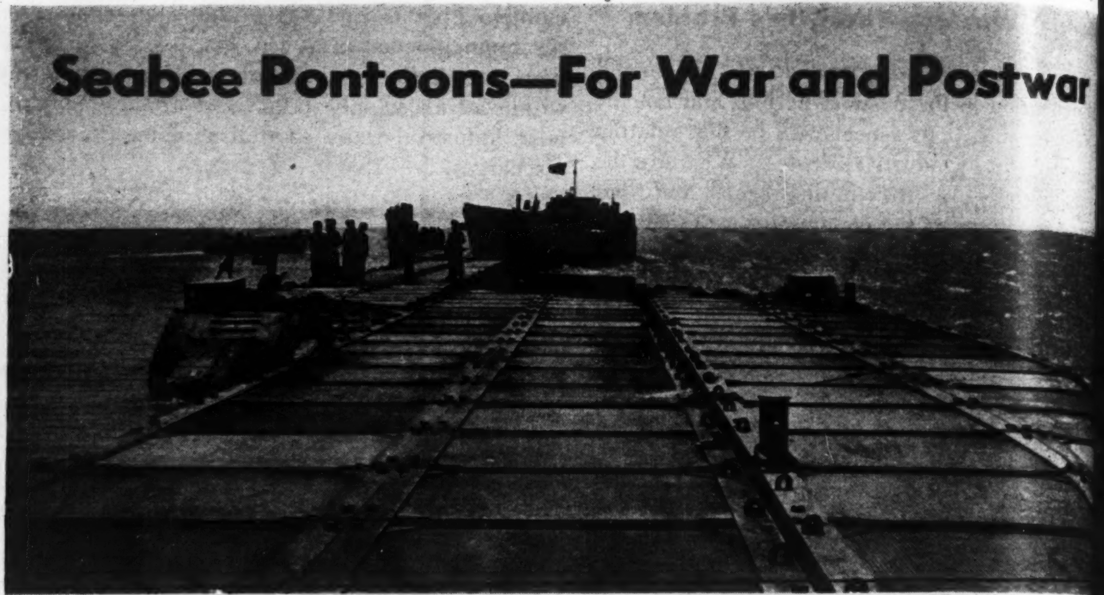
Seabee Pontoons—For War and Postwar



Official U. S. Navy Photo

Fig. 1. This causeway from the shore to landing barges was built quickly by assembling standard Navy pontoon

Contents in Brief*—Steel pontoons 5x7 ft. in plan and 5 ft. deep fastened together rigidly in many combinations are being used for landing ramps, bridges, piers, barges, even drydocks. Developed by the Navy Bureau of Yards and Docks, the units are made to be connected rapidly with a minimum of equipment. They can be readily moved by rail or truck, assembled or disassembled by unskilled labor without special tools, and in peacetime can serve as an emergency bridge, a crane barge, or wharf. The units are relatively inexpensive for the purposes they serve.*

PONTOONS IN SMALL UNITS that may be assembled into any desired shape for bridges, barges and the like have proved one of the most versatile and valuable pieces of equipment for war and undoubtedly will prove to be a useful contribution to peacetime construction practice. Developed by Capt. John N. Laycock of the Civil Engineer Corps, Bureau of Yards and Docks of the Navy, before the U. S. entered the war, these pontoons were available quickly when the Navy needed them.

The assembled units as used by the Navy consist of two or more "strings" of connected rectangular boxes that can be put together like a set of building blocks fitted into an "Erector" set. The small pieces are transported by ship and assembled where needed in numbers to suit local requirements for use as causeways, floating piers and landing connections, lighters, fuel and water barges, wharves, as a base for floating cranes up to 75-ton capacity and for floating drydocks. By adding specially designed propulsion units the barges can be made into ferry boats, tugs and ice breakers.

The pontoon unit is an all-welded box 5x7 ft. in plan and 5 ft. deep. There is only one variation from this size, a unit 7x7 ft. on top and 5 ft. deep but curved at one end for use as the bow or stern of a barge. To the Navy, the word "pontoon" refers only to these boxes. The work units are designated by the number of individual pontoons and strings of pontoons that are attached to make the required shape. For example, a "2x12" unit would consist of two strings of twelve pontoons. It would have an area of about 14x70 ft., there being a 9-in. space longitudinally between pontoons.

The pontoons have a ¼-in. plate top and bottom, and 10-gage metal, about ⅛ in., for sides and ends. are heavily braced internally to t direct loading from tanks or tru on the bare surface. They are tes to withstand an internal pressure 25 psi. and submergence, empty, 28 ft. of water. Pontoons each wei 2,000 lb.; the angles and connecti necessary for attachment add an av age of 800 lb. to the bare unit make a total weight of 2,800 lb. net buoyant capacity of each ponto is about 4 tons.

Quick and easy assembly

Several pontoons are assem into a string, with an angle each of the four sides of the stri to which the pontoons are attach by special rapid-acting devices. Th angles, 6x6x⅜ in., 6x6x½ in. or 8x8 in., depending on the use to whi the assembly will be put, are cut lengths suitable for fastening to definite number of pontoons. Th have accessory wedge-bars welded them to space the pontoons 9 apart and are punched to accom date fasteners. Some of the ang are equipped at the ends with a sp arrangement, using a breech-plug th slips into position and is locked by ⅛ turn of one of the angles. Whe the heavier 8x8x½ in. angles spliced, they ordinarily are welde

Pontoons are arranged for bolt c

ections at each corner and a special cking device for attachment to the ngles, a wedge bolt, wedge and handwheel nut being used to make the onnection. This hardware, or "jewlry," as it is known by the using orces, is arranged to draw the ponoon tight up to the angle and hold t securely. Either the common bolt, urned into a nut welded to the angle, r the special wedge-bolt arrangeent, will develop the full strength f the string of units.

Strings of pontoons are put toether on shore or on the deck of a essel and launched in one piece. wo simple and satisfactory methods ave been devised—side launching y assembly along the edge of the upporting structure and dumping verboard, or end launching by asembling the pontoons on rollers and hoving the full string endwise into he water. Nothing appears to damge the pontoon strings short of exlosives, hence, in side-launching, the tring is dropped overboard with a plash by raising the inside edge by ack or crane and dumping the string verboard. In end-launching, the tring is allowed to run out over the ollers until it tips and one end goes own into the water.

The several strings required to ake up the desired unit are connectd after they are in the water. Tops f the strings are connected first by riving a tight link, a tapered and slotted fastener, through the angles of two adjacent strings of pontoons and then driving a pin or wedge through the slot of the link, Fig. 4.

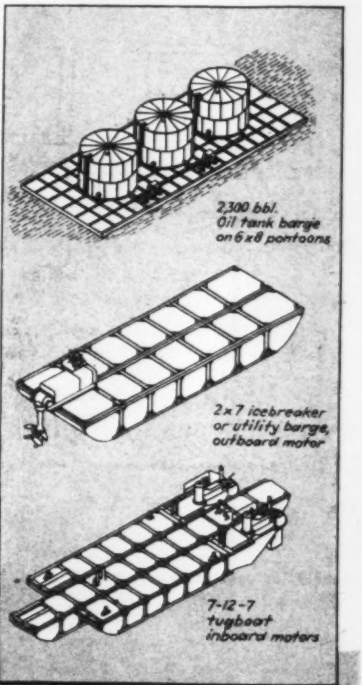
The strings are fastened together at the bottom by a tie-rod assembly a few inches above the actual bottom of the pontoon and just below the water surface when the pontoons are not loaded. The rods are partially assembled on the deck of the barge or just below it and then worked into position and tightened by taking up on a bolt and turnbuckles. What is known as deck closure channels are placed in the 9-in. opening between pontoons to complete a solid deck. Cleats, chocks, bollards and the like, designed for connection to the longitudinal angles, are installed for attachment of mooring and towing lines.

The pontoon strings are stiff in torsion. Structures assembled from them are highly rigid. On tests, individual strings of eleven pontoons acting as a bridge supported at the end, carried 50 to 60 tons at the center plus 25 to 30 tons near the end. Two strings of twelve pontoons, secured side by side, and supported at the ends, are strong enough to carry a 40-ton vehicle. In another test, a string of eleven pontoons supported at three corners and carrying 20 tons live load at the center dropped a little over 2 in. at the unsupported corner. Assemblies up to 105 ft. long are sufficiently strong to carry the stress developed by the submersion of the entire string by a concentrated load applied at its center.

Pontoons in action

Ramps and bridges are formed of two strings of twelve units each. Barges are made of three strings of seven pontoons, four strings of twelve pontoons (100 ton capacity), six strings of eighteen pontoons, seven

Fig. 2. Typical uses to which the versatile pontoons are put by the Navy.



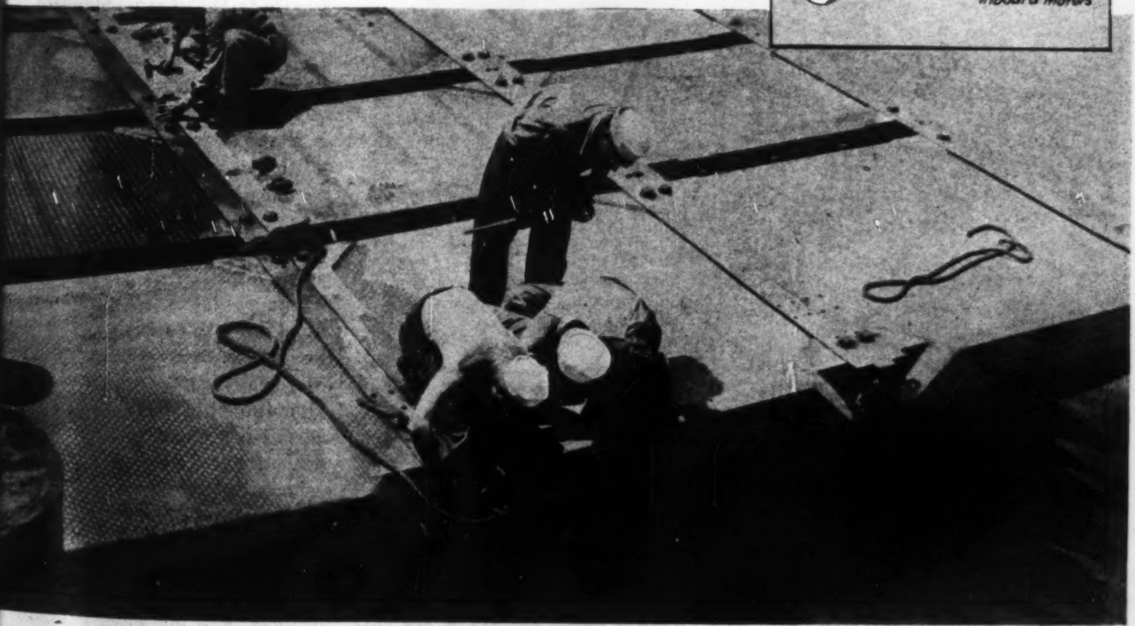
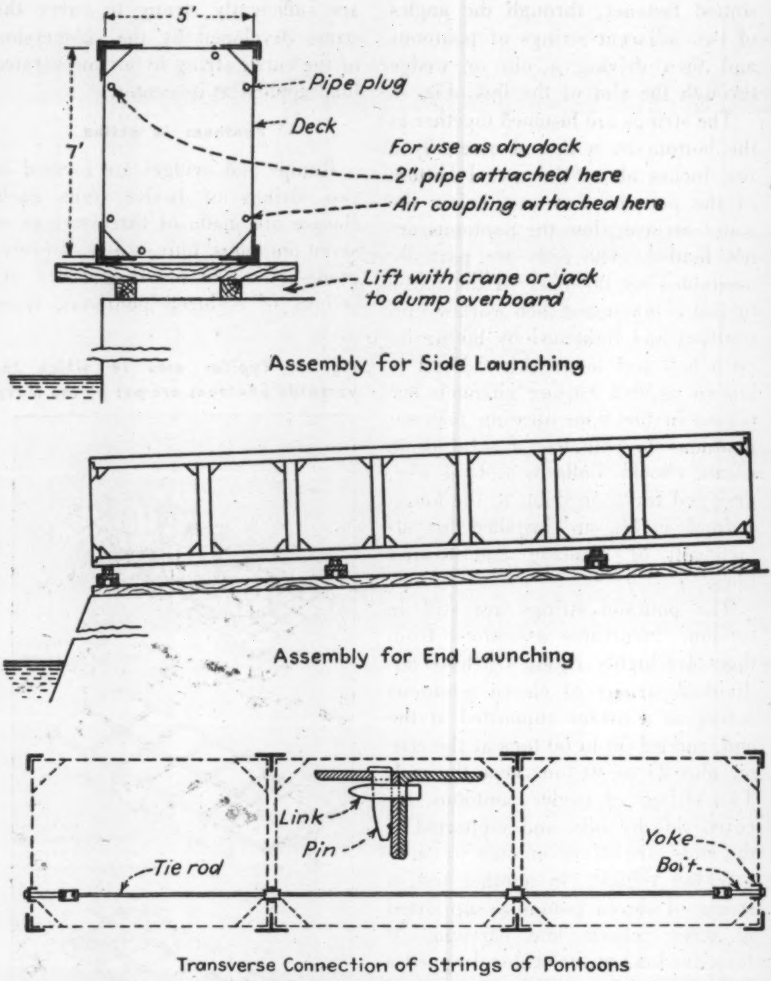


Fig. 3. Pontoon strings are connected after they are in the water. Only the simplest of hand tools are required.

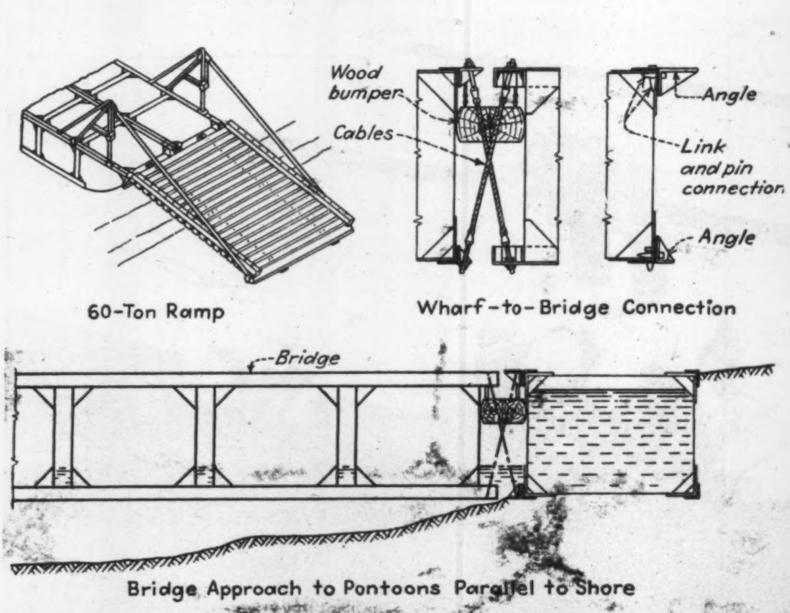


Assembly for Side Launching

Assembly for End Launching

Transverse Connection of Strings of Pontoons

Fig. 4. Strings are assembled on shore, dumped overboard and then connected to form the desired width of floating structure.



60-Ton Ramp

Wharf-to-Bridge Connection

Bridge Approach to Pontoons Parallel to Shore

Fig. 5. Fittings are provided to make field assembly simple for use of the pontoons as shore connections.

strings of thirty pontoons and even larger. The 7x30 provides a deck about 50x75 ft. with a load carrying capacity of 500 tons.

An outboard motor propulsion unit of about 140 hp, is provided as standard equipment and may be attached at either end of a barge to make a ferry boat or lighter out of the pontoons. Frequently, two or even three outboard motors are used on a barge, depending on its size. A single motor on a 2x7 barge has been found very satisfactory as an ice-breaker. Inboard propulsion units of similar power are built into a special pontoon that may be needed for specific purposes. A 7-12-7 arrangement of the pontoons, with two inboard units, is frequently used as a tugboat.

Three 1,000-bbl. tanks secured to the deck of a 6x18 barge make a satisfactory water or fuel barge that may be assembled wherever needed. Made self-propelling with outboard motors, these barges are especially useful in refueling ships that must anchor offshore.

There are two standard bridge units, the 2x6 and the 2x12, the latter being 14x70 ft. These may be used for stream crossings but most frequently are employed at advance bases as a means of connecting pontoon wharf units built outshore over deep water. Sea-going vessels then can unload directly onto trucks hauling over the ramps and wharves without the necessity of any lightering service to the shore. Standard ramp ends are available for the bridge units or a single short string of pontoons may be sunk parallel to the shore to serve as a landing connection. Fig. 5 shows a connection from wharf to shore or to bridge that permits movement of the adjacent units without strain. Cables necessary for this use are furnished as standard equipment.

The pontoons have real war uses in addition to supplying "back-of-the-line" services. An example is a causeway from such craft as LST (Landing Ship, Tanks) which go aground in about 4½ ft. of water, too deep for mobile equipment to get ashore. In preparation for invasion, two strings of pontoons are put on each side of the LST and lashed in position so that as the shore is approached they can be cut loose and dropped into the water alongside the ship. The strings are made up in ths sufficient to reach up onto the ing beach, with length to spare emergencies. As the LST grounds stops, the lighter draft pontoons e on shoreward. Doors of the T are swung open and one of the ble strings of pontoons is pulled k by a winch into the mouth of ship. Shoreward, the two double toon strings lap each other for a siderable length so that equip- t moving into battle is driven di- ly ashore, Fig. 1. Medium tanks, carriers and all heavy equipment off the LST's into the fight, the toons being strong enough to port the concentrated load even n grounded on the beach.

Drydocks for ships

Each pontoon unit is built with e openings, which usually are sed with a plug. Special piping these openings makes it possible to the pontoons as a floating dry- k by admitting water into indi- ual sections to submerge the as- bly. Water is expelled, when de- ed, by pumping air through the opening to force the water out.

Special connections are provided attaching pontoons as vertical gwalls that act as stabilizers to p the drydock level while the deck under water and to prevent com- te submergence of the unit. A der barge, usually made of pon- n units, is connected to the dry- k by a hinged ramp and carries mpressors, air manifolds and con- l valves.

At the time the pontoon strings are embled, a short piece of 2-in. pipe connected through a street ell to e normally plugged opening near e bottom of each pontoon. Regular hose couplings are screwed into e top opening and connected to se lines from the tender barge. hen a ship is to be docked the inlet pes are lowered into the water and e dock permitted to submerge by ening valves on the air line to mit water to displace the air in e pontoons. When the drydock has bmerged to the depth desired, the lves are closed and, when it is sired to raise the dock, air is used force out the water. After the deck above water the inlet ends of the in. pipes are brought to above the rface to avoid the possibility of intentionally flooding.

Adjustable boat supports are provided to fit the keels of small vessels. Catwalks are available for placing in the spaces between the tower pontoons to facilitate handling of lines during the docking of a ship while the deck is submerged. PT boats and seaplanes are regular users of the smaller floating drydocks of this type.

Table 1 shows the current sizes and capacities of some of the docks, but the idea continues to be developed for larger units.

TABLE I. SIZES AND CAPACITIES OF PONTOON DRYDOCKS

Pontoons used	4x15	6x18	6x24	6x30	7x30
Capacity, long tons	100	250	325	400	475
Size, feet	28x87	43x105	43x140	43x175	50x175
Number of compressors (210 cfm @ 100 psi)	2	3	4	4	

Floating cranes

Small crawler cranes, 5-ton capacity, are mounted on a standard 3x7 pontoon barge and lashed down with cables. A 10-ton crane is mounted on a 4x7 pontoon barge, while a 20-ton crane is mounted on a 5x12 unit, the latter usually requiring a special frame to distribute the load over several pontoons. The barge sizes mentioned are sufficient to provide safe freeboard with a full circle swing of the crane with its rated full load.

Most ingenious of the cranes is a 75-ton capacity, fixed-boom unit especially designed to be mounted on a 6x18 barge. It has a working height of 66 ft. and an overhang of 40 ft. from the bow of the barge on which it is mounted. The boom is shipped as loose structural shapes and may be assembled and erected on the barge without large equipment.

A gin pole is used to raise assembled trusses of the boom to vertical position and assemble them into a single piece. Jacking poles are then utilized to raise the boom to final position. A power winch, gasoline-driven, is the hoisting unit during assembly and is subsequently employed for operation of the crane.

Seabees and engineer officers of the Bureau of Yards and Docks of the Navy continue to devise new uses for the pontoons, some of which are standardized for greater usefulness in all theatres of operation.

Formal recognition of the contribution of Captain Laycock in the development of this craft-of-all-work was a Legion of Merit award, presented by Vice Admiral Ben Moreell, Chief of the Bureau of Yards and Docks.

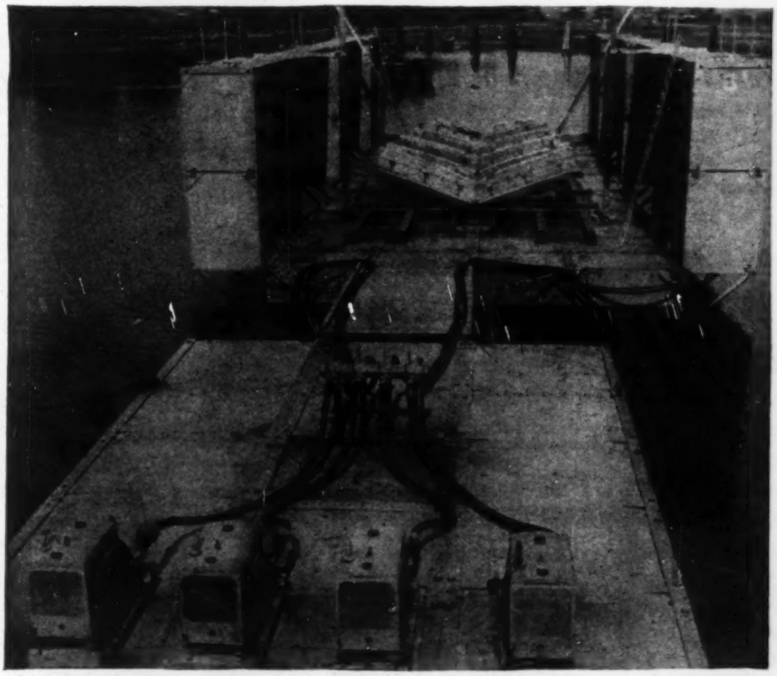


Fig. 6. Pontoon drydocks are frequently used for docking PT boats in advance areas. Compressors and controls for flooding and emptying the pontoons of the drydock are set on a barge, also made of pontoons. Cradles are part of "standard" equipment.

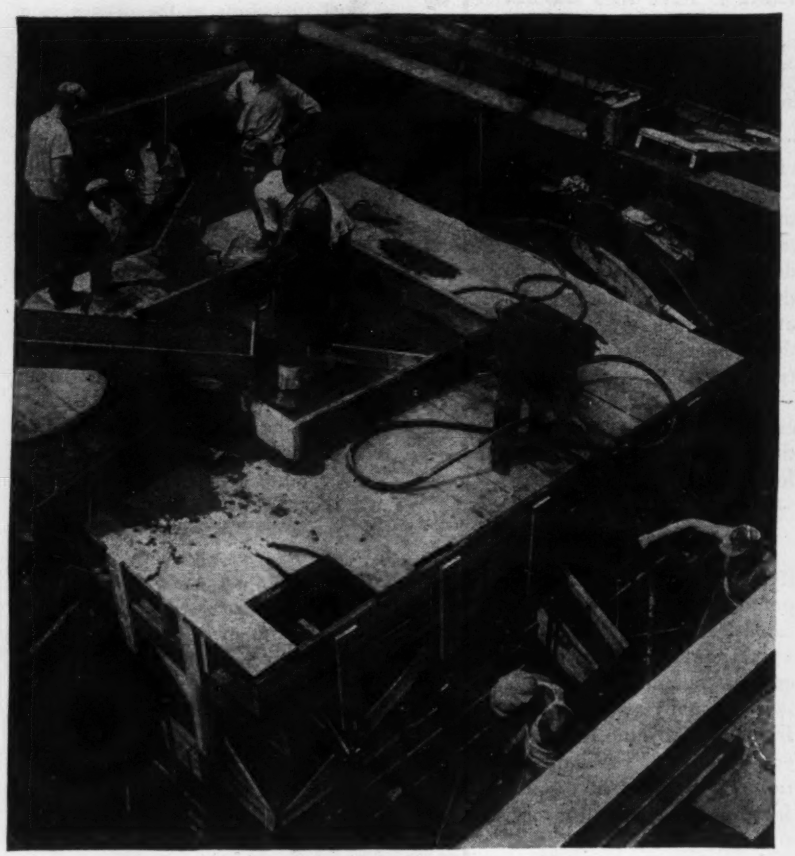


Fig. 1. Concreting the first section of Shaft 1 inside the "splicing chamber" cofferdam. Tunnel "eye" is shown in the upper right background.

Tunnel Construction In Soft Ground

Oscar S. Bray

Structural Engineer, Jackson & Moreland, Boston, Mass.

Contents in Brief*—*An 8-ft. inside dia. tunnel in soft clay below a tidal river was built under compressed air without the use of a shield, the excavation being done by hand labor. The lining, which consists of 15 in. of plain concrete inside light steel liner plate, was also constructed primarily by hand. Shafts were sunk almost entirely as open caissons, air work being required only for the final section of one shaft. Recommendations and suggestions for similar work are made available.

A SMALL TUNNEL recently completed under an East Coast tidal river provides an interesting design example and illustrates the advantages of setting up a flexible construction plan to meet subsurface conditions developing during progress of the work. Success of the procedure followed was demonstrated when several major changes were made without excessive delays.

The tube was constructed by the Boston Edison Co. as a connecting link between its new generating station (*ENR*, Dec. 30, 1943, p. 966) and an important section of its distribution system. General requirements were that the 1,100-ft. long tunnel have an 8-ft. inside diameter, a 0.5-percent slope for drainage and a minimum earth cover of 10 ft. below future dredging depth. The shafts were to measure 15 by 15 ft. inside and each was to be surmounted by a 18x30-ft. splicing chamber with a 13-ft. clear height. The splicing chamber floors were to be located roughly 17 ft. below ground level, permitting a 12-in. minimum earth cover over the roof of the chambers.

Tunnel in soft clay

Borings taken at each shaft location and at 100-ft. intervals along the general line of the tunnel indicated that the material to be penetrated was, for the most part, a medium or soft blue clay containing numerous sand lenses and pockets. The lower portion of Shaft 1, which is on the far side of the river from the generating station, and a short section of the tunnel adjacent to it were expected to be in a compact, water-bearing mixture of sand, gravel, boulders and clay. Shaft 2 was expected to bottom in soft clay containing some fine sand.

Upon studying the borings the design engineers reached the following conclusions:

1. Most practicable method of constructing the shafts was to sink them as caissons, probably without resorting to compressed air.
2. Tunnel could be driven under comparatively low air pressure without the use of a shield.
3. Development of pressure on the temporary tunnel lining would be slow, permitting the use of relatively light liner plates, reinforced and braced where necessary because of local soft spots.

Since the space adjacent to Shaft 2 was expected to be fully utilized in constructing the generating station, it was deemed advisable to drive the tunnel from Shaft 1. To facilitate drainage during construction and the removal of muck, this shaft was made the low end of the tunnel. To provide the desired 10-ft. minimum cover over nnel, the top of the lining at the ade edge of the river channel was at 10 ft. below the probable fu- dredging depth or 40 ft. below water, thus locating the tunnel line.

aft 1 with this layout was 69.5 ft. from ground surface to tunnel and the other shaft 64 ft. nd conditions at greater depths that selected offered no better nd for tunneling, and hence no on for going deeper.

udy of the boring samples indi- that ultimate pressures on the zontal faces of the tunnel would full hydrostatic pressure cor- onding to river level at normal tide (10 ft. above mean low r), plus the full buoyant weight e overlying soil. Ultimate pres- against the vertical surfaces was cted to reach full hydrostatic sure plus from 0.3 to 0.8 times the ant weight of the overburden. , the tunnel lining, which was to ist of concrete, preferably with- reinforcing, inside a primary lin- of pressed steel plates ⅛ to ¼ in. , was designed to resist the pres- shown schematically in Fig. 2. shafts were designed to resist a sure of 95 lb. per sq. ft. per ft. of h.

Lining of plain concrete

esign investigations of the tunnel g showed that a 15-in. thickness 5,200-psi. concrete could be used out reinforcing, but that thinner ions would necessitate the addition ension steel. It was felt that the higher unit placing cost for the thinner lining, plus the added concrete placing cost introduced by the use of reinforcing steel, would more than over-balance the cost of the additional concrete required by the thicker section.

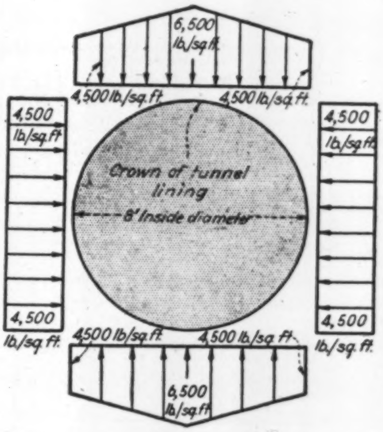

6,500 lb/sq.ft
4,500 lb/sq.ft
4,500 lb/sq.ft
4,500 lb/sq.ft
4,500 lb/sq.ft
Crown of tunnel lining
8' Inside diameter
4,500 lb/sq.ft
4,500 lb/sq.ft
4,500 lb/sq.ft
4,500 lb/sq.ft
6,500 lb/sq.ft

Fig. 2. Loading used in designing the tunnel lining, the weight of the tunnel itself being neglected.

As a check on this deduction, bidders were asked to state in their bids based on the 15-in. lining their expected changes in cost for 18- and 12-in. linings. The returns justified the earlier conclusion as to the economy of the 15-in. thickness.

The caisson method of constructing the shafts had been chosen because of ground conditions as previously noted. The wall thickness remained to be determined.

This thickness was based on the following considerations:

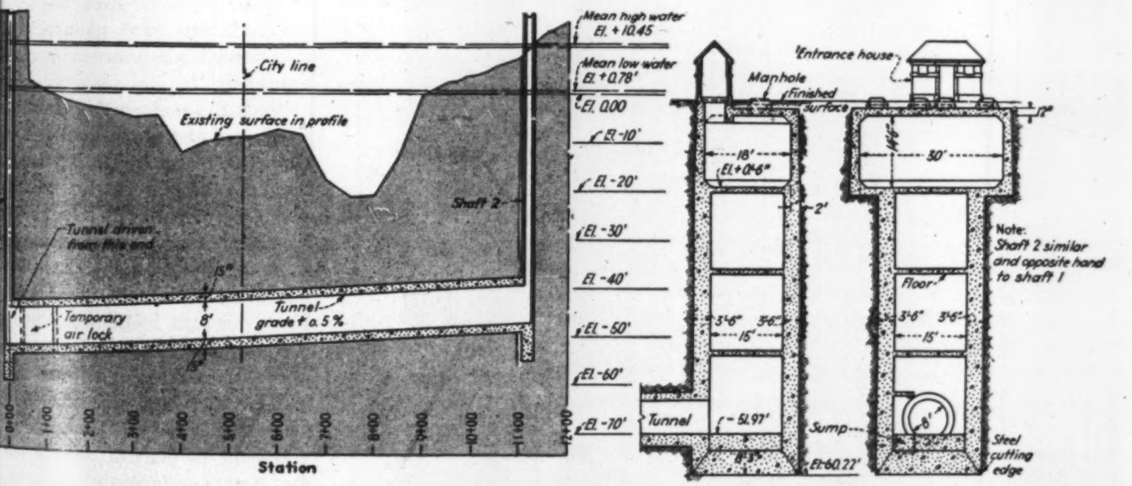
1. Walls must possess sufficient weight to be self-sinking, the probable skin-friction being estimated at about 400 lb. per sq. ft.
2. Walls must be thick enough to resist the external pressures without the use of excessively heavy reinforcing.

To satisfy these two requirements, the shaft walls were made uniformly 3 ft. 6 in. thick. This design gave the caisson an exterior surface area of 88 sq. ft. per ft. of height, and a corresponding sinking weight of about 39,000 lb., sufficient to overcome about 440 lb. per sq. ft. of skin friction. The shafts were reinforced for a maximum external pressure of 6,900 lb. per sq. ft. Generous fillets were provided at the inside corners for better stress distribution, these also facilitating the stripping of interior forms.

The dimensions of the two shafts were identical except for necessary modifications of grade and reversal of hand, and for the larger tunnel "eye" used in Shaft 2 to compensate for construction errors in tunnel alignment. The quantity of reinforcement used in Shaft 1 was considerably greater than that in Shaft 2, due to differences in the building codes in the municipalities in which the shafts are located.

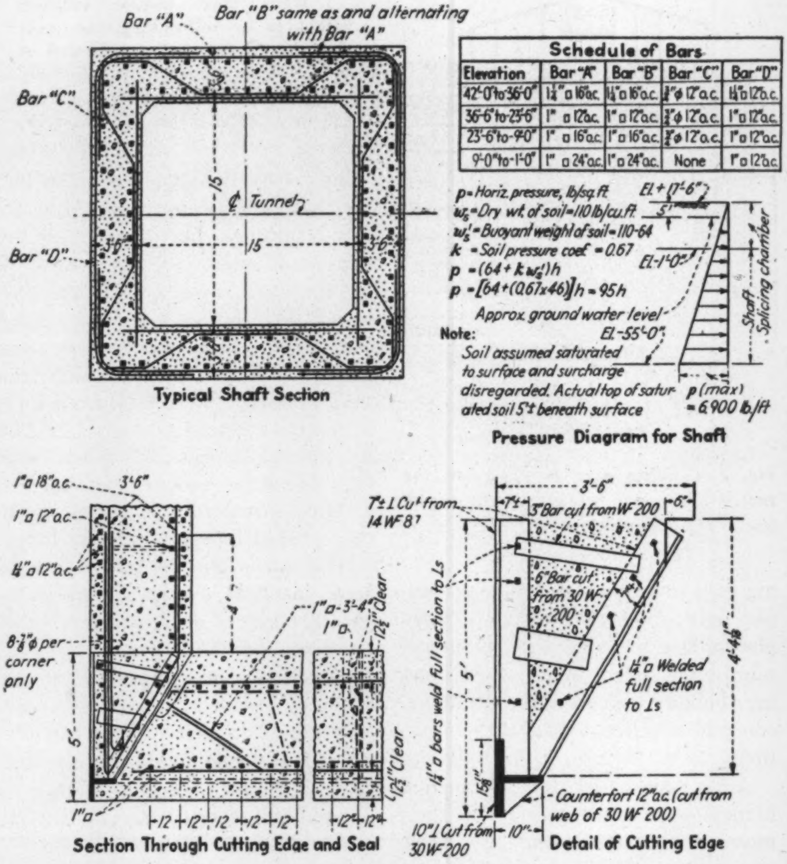
Cutting edges made of salvage steel

Because of the lack of steel plate, cutting edges for the caissons were fabricated from structural tees cut from salvaged wide-flange beams. The all-welded edges (Fig. 3) were tied to the caisson concrete by means of upright and inclined tees, cross-tied with straps cut from the beam webs, and welded to the concrete reinforcement.


Mean high water El. +10.45
Mean low water El. +0.78'
El. 0.00
El -10'
El -20'
El -30'
El -40'
El -50'
El -60'
El -70'
City line
Existing surface in profile
Shaft 2
Tunnel driven from this end
15"
8'
15"
Temporary air lock
Tunnel-grade ↑ 0.5%
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
11+00
12+00
Station
Entrance house
Manhole
Finished Surface
12"
18'
El+0'6"
30'
2'
Note: Shaft 2 similar and opposite hand to shaft 1
Floor
3'6"
3'6"
15'
3'6"
3'6"
15'
Tunnel
-51.97'
Sump
El-60.22'
8'
Steel cutting edge

Enlarged Details of Shaft 1

3. The tunnel—1,100 ft. long and of 8-ft. inside dia.—penetrates a material principally soft to medium clay. A minimum er of 10 ft. below future depth of channel was required. Shafts were of the general layout shown at the right.


Bar "A"
Bar "B" same as and alternating with Bar "A"
Bar "C"
Bar "D"
℄ Tunnel
15'
Typical Shaft Section
p = Horiz. pressure, lb/sq. ft.
w_s = Dry wt. of soil = 110 lb/cu. ft.
w_s' = Buoyant weight of soil = 110-64
k = Soil pressure coef. = 0.67
p = (64 + k w_s')h
p = [64 + (0.67 x 46)]h = 95h
Approx. ground water level
Note: Soil assumed saturated to surface and surcharge disregarded. Actual top of saturated soil 5'± beneath surface
El + 17'-6"
El -1'-0"
El -55'-0"
5'
Shaft Splicing chamber
p (max) = 6,900 lb/ft
Pressure Diagram for Shaft
1"□ 18" o.c.
1"□ 12" o.c.
1¼"□ 12" o.c.
3'-6"
4'
8-⅞"φ per corner only
5'
1"□
1"□-3'-4"
1½" clear
1½" Clear
12 12 12 12 12
12 12
Section Through Cutting Edge and Seal
7"⊥ Cut from 14 WF 87
3'-6"
3" Bar cut from WF 200
6" Bar cut from 30 WF 200
1¼"□ bars weld full section to ⊥s
1¼"□ Welded full section to ⊥s
4'-4⅛"
Counterfort 12" o.c. (cut from web of 30 WF 200)
10"⊥ Cut from 30 WF 200
10"
Detail of Cutting Edge

Schedule of Bars				
Elevation	Bar "A"	Bar "B"	Bar "C"	Bar "D"
42'-0" to 36'-0"	1¼" □ 16" o.c.	1¼" □ 16" o.c.	¾" φ 12" o.c.	1¼" □ 12" o.c.
36'-6" to 23'-6"	1" □ 12" o.c.	1" □ 12" o.c.	¾" φ 12" o.c.	1" □ 12" o.c.
23'-6" to -9'-0"	1" □ 16" o.c.	1" □ 16" o.c.	¾" φ 12" o.c.	1" □ 12" o.c.
9'-0" to -1'-0"	1" □ 24" o.c.	1" □ 24" o.c.	None	1" □ 12" o.c.

Fig. 4. Reinforcing layout for Shaft 1, which was designed for force diagram at upper right. Diagonal bars were omitted in Shaft 2 under a building code allowing higher diagonal tension stress in concrete. Cutting edges of both caissons were built up of structural tees cut from beams, as illustrated at lower right.

Triangular pieces of beam web also were welded between the stem and lower bar of the cutting edge to provide additional stiffness. The corners were reinforced with angles cut from scrap lengths of Z-piling.

Although it was expected that shaft sinking could be completed and tunnel driving started without the use of compressed air, recesses were provided at the levels of the two intermediate floors in each shaft to receive and anchor an air deck should air work prove necessary. The wisdom of this precaution was later demonstrated when both shafts had to be placed under air, Shaft 1 to facilitate starting the tunnel and Shaft 2 to complete the sinking operation (Fig. 5).

Splicing chamber design was conventional. The roof was designed as beam-and-slab construction (because of the numerous openings required), and the walls and floors as slabs. The walls were designed to resist full earth pressure as cantilevers to permit backfilling before installation of the roof, thus preserving free access to the tunnel during construction.

Access to the chambers and shafts is provided through entrance houses on the chamber roofs, and by manholes located to facilitate installation of cables in the ducts leading into and out of the chambers. The entrance houses contain the lighting controls, fan, and air inlets.

Initial construction operation

The construction plant was set up adjacent to Shaft 1, where work started. The initial operation was to build a steel sheetpile cofferdam enclosing the location for the splicing chamber. Cofferdam excavation was carried to about 5 ft. below the bottom of the splicing chamber floor, following which a 4-ft. layer of gravel was placed for drainage and to provide a working surface.

The cutting edge was erected on wood sills embedded in this surface, the forms set, and the initial 12-ft. section of the shaft concreted (Fig. 1). The forms were then raised and second and a third 12-ft. lift add The sills under the cutting edge w then cut away and sinking started. cavation was by clamshell bucket by hand excavation into skip hoisted by a steam-powered, full-volving crane.

Construction of additional lifts sinking of the caisson alternated til the structure reached grade, the bottom was cleaned out, about in. of gravel added and the reinforc concrete seal built. Bleeder pipes extended through the seal and into gravel to eliminate hydrostatic pr sure under the concrete before it developed sufficient strength to res such a pressure.

Use of air proves necessary

Following sinking and seal of shaft, the wood-and-steel bulkhe closing the 11-ft. 6-in. dia. tun "eye" was cut out and an attem made to open the tunnel. The origin plan was to drive roughly the first ft. in free air to permit installation an air lock. But free air tunneli proved impracticable, and excavati was halted while an air deck was co structed in the shaft and air locks stalled. With these in place, the pressure was raised to slightly abo 25 psi. and excavation resumed wi out further difficulty.

When roughly 50 ft. of tunnel h been driven and lined, two heavy co crete bulkheads were built in the tu about 30 ft. apart. Lock doors were stalled in the bulkheads to form th "permanent" construction air lo (Fig. 6). The air deck and locks the shaft were next removed, permi ting tunneling to proceed on a produ tion basis.

Shaft 2 was started when about percent of the tunnel had been line It was sunk by the same methods a Shaft 1. Working space limitation and shaft location made the use o floating equipment convenient an economical; consequently this sha was worked from the water side (Fi 7).

Sinking proceeded without incide until the cutting edge was approx mately 15 ft. above final position when the caisson lodged, and it wa necessary to place a 200-ton load o the structure before sinking was re sumed. At this time the average ski friction was estimated at about 625 lb per sq. ft.

Shortly before "bottoming," the ing edge passed into a saturated r of fine sand and silt. Consider- water entered the caisson through bottom, and it was feared that her drainage, coupled with pos- e loss of ground, might produce esirable settlements of adjacent ctures, several of which rested on s bearing on a soil stratum well ve the bottom of the caisson. For reason, air locks were installed sinking completed under 25-psi. pressure.

Tunnel excavation procedure

Mining in the tunnel was carried on hand methods with the aid of umatically-operated clay spades. e excavation procedure was gener- as follows: The upper half of the nel section was advanced for a ance of from 8 to 15 ft. and the er liner plates, supported tempora- on blocking resting on the bench, e installed more or less closely be- d the heading, depending on the terial encountered. The lower half he heading was next cut away and bottom liner plates installed, the er segments being supported dur- this operation by jacks and block-

The excavated material was hand- ded into skips on narrow-gage cars dily shuttled back and forth by man. It was found entirely prac- ble to excavate the clay closely ugh to the plate line to make pack- or grouting outside the plates un- essary.

Contrary to earlier expectations, air ssure of about 25-psi. was re- ired throughout the tunnel driving ration to control the water. Low- ssure air was supplied for the tun- ing work by two diesel-driven two- ge compressors with a combined pacity of 1,800 cfm. of free air. A 0-cfm., two-stage diesel-driven com- ssor supplied high-pressure air for pneumatic equipment. The com- ssors were mounted on an 86x32-ft. el barge fitted with a steel house, hich also contained the air receiv- , after-cooler, diesel-powered gen- tor, auxiliary equipment and a mpletely equipped hospital lock.

Concrete placed in forms by hand

When the heading had been ad- nced a minimum of 10 ft., the steel nnel forms were brought ahead, igned and filled with concrete. The concrete was delivered in narrow-gage cars, shoveled into the forms by hand and compacted by internal vibrators, supplemented by hand spading. Concrete for the crown section, rammed into place, was mixed with a 1-in. slump or less, in contrast to the 2- to 4-in. slump of the concrete for the lower sections. After the top form had been completely filled and closed, an external vibrator was applied beneath the crown to produce a smooth surface and to aid in compacting the concrete.

Mechanical placing of the concrete, including the use of pneumatic methods and pumping, was given serious consideration at the start of the work but was discarded in favor of hand placing because of the economy and

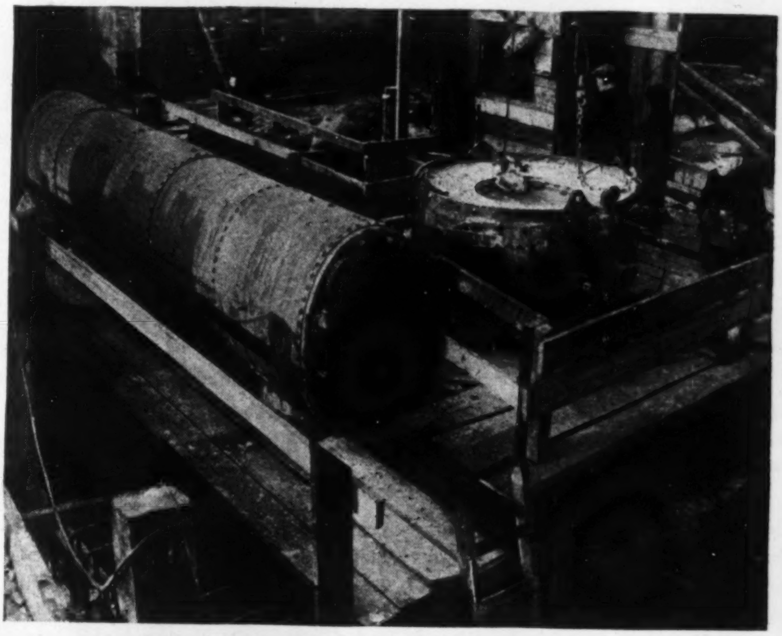


Fig. 5. Muck and man locks employed at ground surface at Shaft 1. The man lock is horizontal to provide rest space for the workmen during the decompression period. Shaft 2 installation was similar.

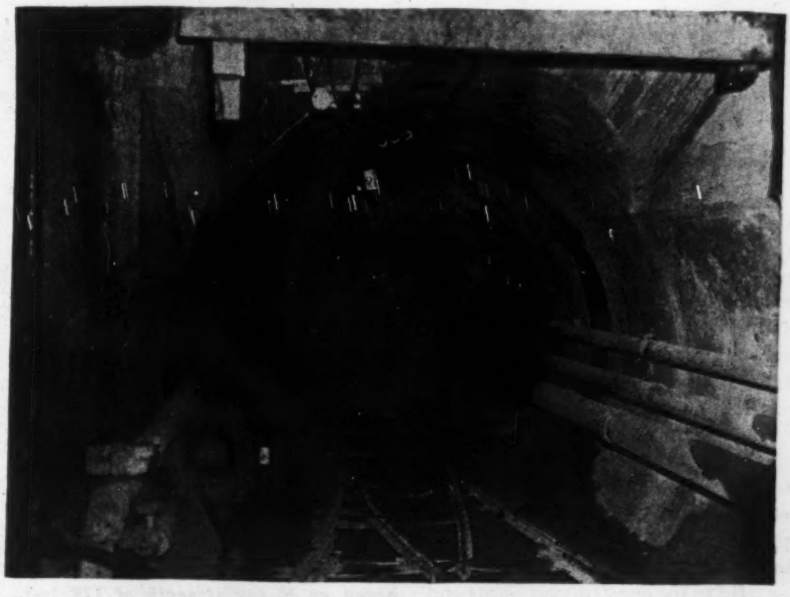


Fig. 6. To permit construction under compressed air, an air lock was installed in the tunnel just outside Shaft 1. View shows the outside door as seen from shaft.

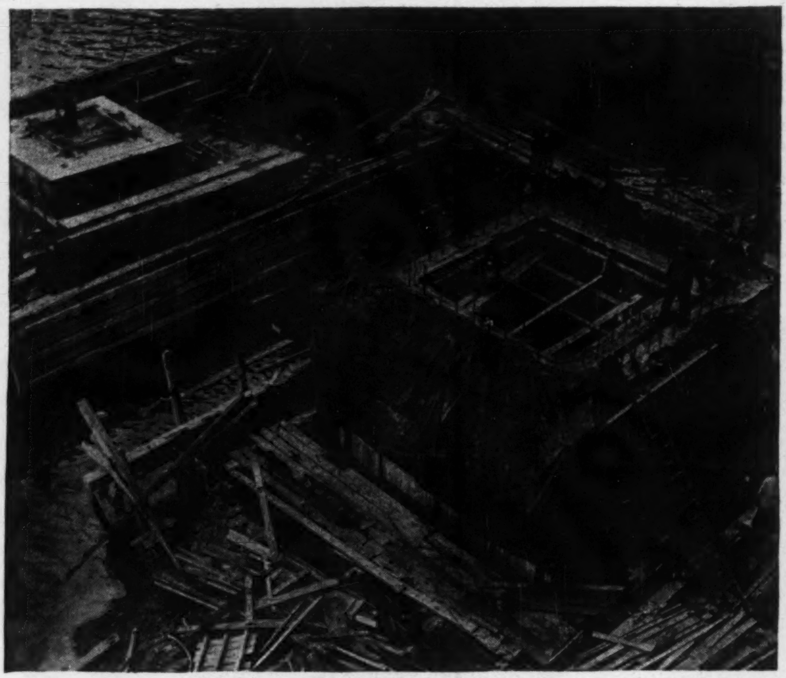


Fig. 7. Because of space limitations Shaft 2 was worked from the water side. At left is the floating rig used for excavating inside the caisson and for placing the concrete.

simplicity of the latter, and because the limited space available in the forms and in the tunnel restricted the use of mechanical equipment. While the hand work proved economical and in the main satisfactory, it is believed that a larger tunnel would clearly justify the necessary expenditure for placing equipment.

Construction joints in the lining were of the plain butt type, without reinforcing rods or sealing strips. This design simplified concrete placement.

Leakage overcome by grouting

Voids in the concrete lining were filled with cement grout injected through fittings set in holes drilled in the concrete, the holes being located principally in the crown quadrant. Initial grouting was done while the tunnel was still under air pressure, generally following about 10 days behind concrete placement.

Final grouting was delayed until the tunneling had been completed and the air pressure removed, which permitted detection and correction of leaks not apparent with the tube under pressure. During final grouting special attention was paid to the construction joints and other locations where leakage appeared or was indicated by the lining's appearance, location of the leaks generally being marked by a white deposit of lime leached from the concrete.

Both ordinary portland and high-early strength cements were used for the grouting work. No appreciable difference was noted in the results obtained or in the grouting operations. In all, 1,800 bbl. of cement were required for this work.

Leakage in the completed tunnel never exceeded 10 gpm. This flow was reduced by grouting to something less than 4 gpm.

When the tunnel is placed in operation and stable temperature conditions are attained, the flow is expected to be further reduced. Th water will be removed by a 75-gpm. float-controlled, electrically-driven sump pump located at the foot of Shaft 1 and a similar 35-gpm. unit on an intermediate floor in Shaft 2, whe it will intercept drainage from the duct lines entering the splicing chamber.

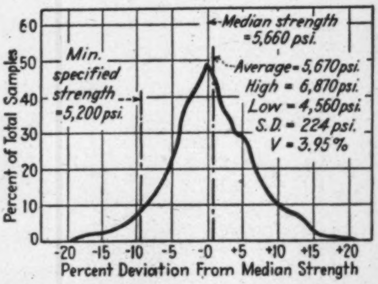


Fig. 8. Strength of Class A concrete as based on 28-day strength of 179 test cylinders.

Experience with the lining leads to the following tentative conclusions:

1. Use of a low water-cement ratio, low-slump concrete is most desirable for this type of work.
2. Placing method for the crown section should be improved to insure full forms and denser concrete and to reduce the grouting required.
3. Form joints should be sufficiently tight to eliminate all leakage, leaks in the concrete lining developing most frequently where the form joints leaked.
4. An improved construction joint should be developed to prevent leakage and at the same time permit the limited movement occasioned by shrinkage and temperature changes.

Two grades of concrete used

Concrete was delivered to the work by 5.5-yd. truck-mounted mixers from a commercial concrete plant. The materials were batched and pre-mixed at the plant, with final mixing during transit. Two grades of concrete were used, Class B for the walls, floors and seals of the shafts, and Class A for all the other work.

Class A was specified to have a minimum 28-day compressive strength of 5,200 psi., a maximum water-cement ratio of 5 gal. per sack, and a minimum cement content of 728 lb. per cu. yd.

Class B requirements were: 4,500 lb. strength at 28 days, a maximum water-cement ratio of 5.5 gal. and a cement content of not less than 658 lb. per cu. yd. Slumps ranged from 2 to 5 in., depending on placing requirements. One exception was the 1-in. slump of the concrete used for the crown section of the lining, as previously noted. Fig. 8 is a chart of the 28-day strength of the Class A concrete based on the data obtained in breaking 179 test cylinders.

Who did the work

The tunnel is owned by the Boston Edison Co. Jackson & Moreland, Engineers, Boston, handled the design and field engineering. The Peter F. Connolly Co., Boston and New York, was the general contractor.

dded Rod Triples Speed of Welding Repair

J. A. Cunningham
Welding Application Engineer
Arcway Equipment Co., Philadelphia, Pa.

***nts in Brief**—A "cold" rod held in the arc puddle on repair welding elted and blended with the electrode metal gives a high-carbon, low- coating on worn parts that has unusual toughness and wear resistance. c. 300-amp. welder is preferred but 200 amp. will do the work and a.c. e used. Two or three times more metal can be applied per hour than her methods and early reports indicate that the process is regarded remarkable advance in hard surfacing.*

R WELDING where large surfaces be built up can be done in a a third of the time usually required by use of a newly developed scheme known as "two-tone" welding. This technique of hard-surfacing consists of welding in the conventional manner with a 1/4-in. E-6010 (mild steel reverse-polarity type electrode) in the electrode holder, while holding one end of a 3/8-in. bare alloy cast iron auxiliary filler rod adjacent to the arc, Fig. 1. (Economy-high carbon alloy steel of 3/8-in. dia. is used for filler rod on high carbon and excessively worn track rails.) Equal quantities of the electrode and filler rod are consumed. It has been determined that 30 percent more amperage than is normally used on the E-6010 electrode is required for two-tone welding. The excess amperage melts down the auxiliary filler rod.

. A 3/8-in. bare alloy cast iron auxiliary filler rod held adjacent to 1/4-in. teel reverse-polarity type electrode mix together in the arc puddle to the speed of repair welding.

If the auxiliary rod were not held in the arc area, this excess amperage would produce a large molten pool of metal on the part being surfaced. But when the auxiliary rod is moved along in unison with the over-charged electrode, the excess amperage merely melts the alloy cast iron filler rod, while the electrode itself is being consumed 30 to 50 percent faster than the normal rate. Since welding progresses more rapidly than usual, the parent metal is not subjected to abnormal heating or warping.

The electrode and the filler rod mix together thoroughly, giving a high-carbon, low-alloy steel deposit which resembles low-alloy tool steel in grain structure, hardness, toughness, and wear resistance. The coating on the E-6010 electrodes mixes with the weld metal and rises to the top in the usual manner. Deposits using Moly H as an auxiliary rod have a hardness of 425 to 525 Brinell, depending upon the rate of cooling, and will not shatter or spall-off.

. Worn parts such as this bottom roller for a crawler tractor may be built welding a rod around the circumference, then surfacing and backing it up e two-tone process.

It is obvious that two-tone welding is extremely fast. Two to three times more metal can be applied per hour than by ordinary methods. Contrary to expectations it is very easy to control the deposit, even on narrow sections and on comparatively thin stock,

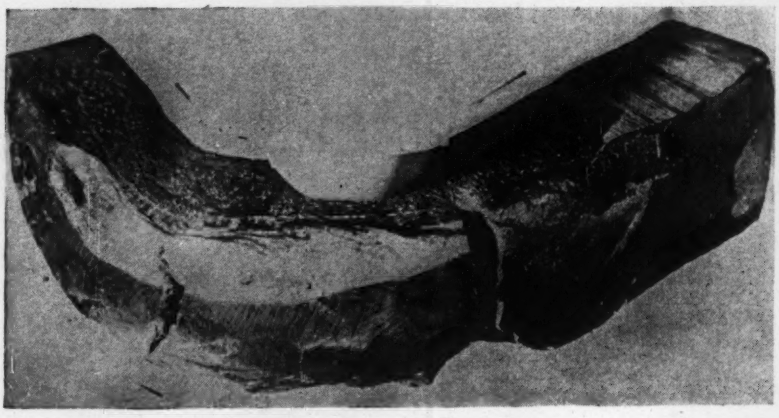


Fig. 3. A two-tone deposit with ¼-in. E 6010 electrode and high-carbon alloy steel filler rod on ½-in. mild plate bent 35 deg. before cracking. Tensile stress is estimated at 150,000 psi. and ductility at 5 to 10 percent.

because the welder can feed in more auxiliary rod at will to chill the molten metal.

The welding operator holds the filler rod, which carries no current whatsoever, in front of the arc in the direction of travel. (When backing up a filler bar, i.e., a weld similar to a fillet weld, the electrode should lead the filler rod to acquire maximum penetration.) The arc is not directed on the filler bar, but is pointed on the work in the usual manner. The electrode is tilted backward from the direction of travel instead of forward, thus permitting a small portion of the arc to "bite" into the everpresent filler rod and melt it down. Best results are obtained by holding an average length arc (28-32 volts). The arc is started by welding without the filler rod in the arc area for about two seconds to acquire a molten pool before feeding in the filler rod. .

Larger filler rod, ⅜-in. Moly H rather than ¼-in., is preferred since it consumes less rapidly and, therefore, the tip of the rod can be maintained at a higher temperature. Smaller filler rods burn off so rapidly that the rod is still cold as it approaches the arc and "sticking" may result. Furthermore, smaller filler rods present the problem of frequently welding the butt ends to a new filler rod. Filler rods larger than ⅜ in. are satisfactory, but require more amperage for melting and are more difficult to manipulate. Smaller electrodes, 7/32-in. or size, may be used when the machine is not capable of produ enough amperage for ¼-in. electr

However, a standard NEMA 200-ampere d-c welder with cable leads has enough capacity weld with ¼-in. E-6010 electrodes 300-ampere set is preferred for advantage, especially for large pairs.

When an a-c, or transformer welder, only is available, E-6030 E-6020 electrodes (commonly hot-rods) can be used in the two process, if the work is flat or tioned 5 to 10 deg. upward. Howe it has been found that, on all types work, an E-6010 electrode with arc welder is preferable. With E- or E-7010 electrodes, the flux is troublesome because it has less ency to accumulate in front of the Furthermore, the operator can duce a thicker deposit when using E-6010 electrode because the dep freezes faster, thus allowing the op ator to weld near an edge or curved surface. Straight-polarity position rods can be used with a-c d-c welders, but in general, E-6 electrodes are not recommended cause the arc is not sufficiently pe trating to bite into and mix th oughly with the filler rod. Furth more the E-6012 electrodes will penetrate as easily through rust, etc. which may be on the base met

Fig. 4 is photomicrographs two-tone welds. The one at

Fig. 4. Photomicrographs of two-tone weld deposits. Left, GE type W 22 (E6010) ¼-in. electrode and Moly ⅜-in. electrode used as filler rod. Right, same arc electrode, W 22, with ⅜-in. bare Amsco Economy as the auxilia filler rod. Both photomicrographs are magnified 500 dia.

eft was made with ¼-in. General Electric W22 (E-6010) electrode and -in. Moly H (alloy cast iron) filler rod. Note that the weld metal has a ne martensitic grain structure. Deposits will withstand severe shock, dge impact, and moderate abrasion. The weld deposits, however, are not machinable. The other photomicrograph in Fig. 4 is a two-tone weld using ¼-in. W-22 and ⅜-in. bare Economy as the auxiliary filler rod. Deposits using Economy as a filler rod are machinable with tungsten carbide cutting tools, but grinding generally s more satisfactory.

When parts are subjected to extreme wear, a ⅛ to $\frac{5}{32}$-in. thick layer of harder and more wear-resistant metal can be applied over the two-tone deposits with a regular hard surfacing electrode. For example, bottom rollers on tractors wear out before the rails, simply because there is less wearing surface on the rollers. Hence, it is advisable to hard-surface over the built-up rollers with Moly H being used alone in the electrode holder. This also helps to obtain a smoother deposit. Moly H should not be used alone on small or excessively worn track rails, however, because it checks and thus invites cracking through the rails.

By using various grades of filler rods, many of the higher-priced hard-surfacing deposits can be duplicated. Where very large areas must be rebuilt a plain cast iron filler rod may be preferred for reasons of economy. In these cases, the deposit will be 50 to 100 Brinell points softer than when Moly H is used as the auxiliary filler rod (depending upon the rate of cooling). Machineable deposits can be acquired by welding with an E-6010 electrode and applying a 70 percent carbon steel auxiliary filler rod.

Use of applicator or filler bars

The proper application of mild steel bars in conjunction with the two-tone process can greatly reduce welding time in rebuilding worn parts on tractors and shovels. Concrete-reinforcing rods or any type of round mild steel bars are satisfactory for this application.

For example, if the face of a bottom roller from a crawler-type tractor was worn away at the edge, a ⅜ or -in. dia. mild steel bar should be welded flush with the roller face around the entire circumference, bending the bar after each one to two inches of weld (see Fig. 2). Hard surfacing is then applied over the entire face with two-tone as the initial deposit and Moly H applied alone as a final deposit. If only one layer is required, Moly H should be applied alone. The roller can then be turned on end and two-tone welding applied underneath the applicator bar for support. Two-tone welding is used in this case for speed advantage only. On applications of this nature, where the weld metal is dammed, the operator can apply about 25 lb. of weld metal per hour.

The process is applicable to many other repairs, worn tractor idlers, driving sprockets steel-mill wobblers, cement mill die rings and all types of rollers. The details of application vary but the principle of using an extra rod to speed filling in of metal is the same. Welding rods of similar characteristics to those mentioned will probably be satisfactory but actual experimental data concerning them is not available.

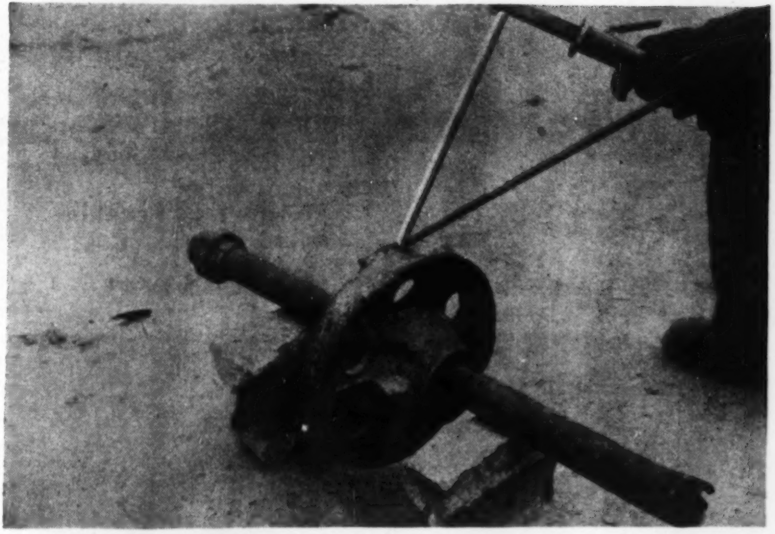


Fig. 5. Rebuilt with two-tone welding, ¼-in. W-22 electrode (300 amps) and ⅜-in. plain cast iron bar used to puddle between the filler bars. Eight rollers were repaired in 18 hours at a cost of $32 for labor and material; cost new $160.

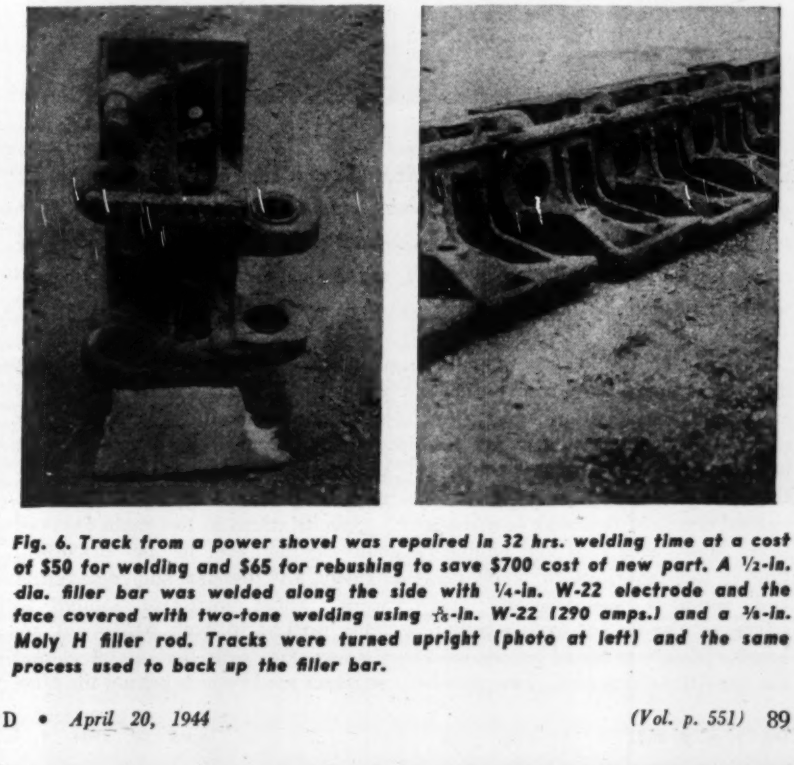
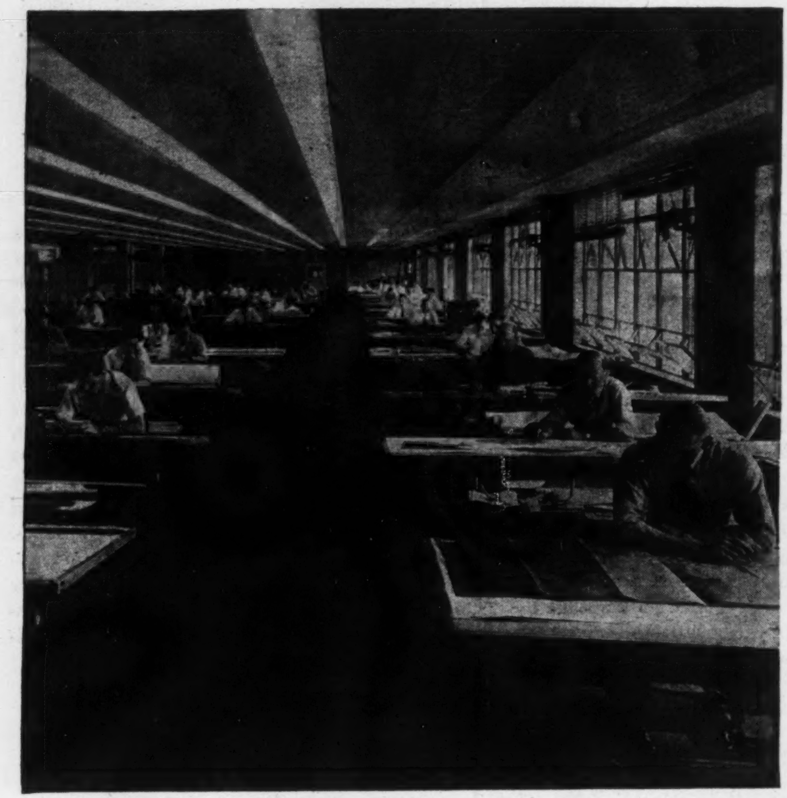


Fig. 6. Track from a power shovel was repaired in 32 hrs. welding time at a cost of $50 for welding and $65 for rebushing to save $700 cost of new part. A ½-in. dia. filler bar was welded along the side with ¼-in. W-22 electrode and the face covered with two-tone welding using $\frac{3}{16}$-in. W-22 (290 amps.) and a ⅜-in. Moly H filler rod. Tracks were turned upright (photo at left) and the same process used to back up the filler bar.

A Formula for Concise Specifications

Robert L. Franklin
Specification Writer, Chicago, Ill.



Behind the designers in this office, and other offices like it throughout the country today, are the specification writers. Upon their ability to prepare easily understandable and readily enforceable specifications largely depends the success or failure of the designers' creative work.

Contents in Brief—*Using the specifications and contract for a breakwater pier construction project as a typical example, the various items that should be included in a construction contract are outlined. Then the contents of each item are considered in detail, suggestions being offered as to how several parts may be improved.*

GOOD SPECIFICATIONS are welded in the heat of many years of experience, and good specification writers are self-made, not born that way. The broadest training in many construction practices is the best protection against errors of omission or commission. Many architects and engineers find it too laborious to write good and complete specifications themselves, or else do not have a comprehensive library or broad knowledge of the conditions involved. Few private firms have enough work under the present wartime conditions to employ experienced specification writers on a full time basis, and so, the best talent today may be found in governmental agencies.

Specifications in two main fields of construction are to be discussed, namely, architectural and engineering work. Those fortunate enough to have worked in both fields will appreciate the truth that architect and engineer are brothers behind the blueprint, subject to the same mistakes in judgment, and both susceptible to the bite of the "profit-motives" bug.

The number of drawings required for architectural work in proportion to the cost of the work is generally greater than for engineering work. Because the work under each building trade is set up in architectural specifications, approximately the same relation exists between the specifications required. A great amount of engineering work may be shown on a few drawings and often on but one, while the specifications describing the materials and methods of performing the work may be of considerable length, particularly if materials are furnished under separate contracts.

A specific example

Past articles in *Engineering News-Record* (Dec. 16, 1943, Vol. p. 902, and March 23, 1944, Vol. p. 431) have given much general aid for writing specifications. This article will be more specific and deal with the main provisions necessary in writing the specifications for engineering works. The specifications and contract recently prepared under the writer's direction for reconstruction of a stone breakwater pier in Jackson Park, Chicago, Ill., are used as an example.

Design and rehabilitation of the pier were carried out under the direction of Ralph H. Burke, chief engineer, and the contract documents were approved by John O. Rees, general attorney, both acting for the Chicago Park District. The wood piles of a pier built more than 30 years were cut off below the lake level, the stone and concrete built eon. The work, which was to pro- the beach off 63rd St. and the rance to the Jackson Park Yacht rbor, was completed in 1943 on a -plus-fee basis, which resulted in ving to the park district of about percent of the lowest bid price.

table of contents of these spe- ications is given in Table I. The ifications include the following s:

vertisement: The advertisement bids states the location and extent e work, in this case one-half mile ngth, with the main items of work ired, and the bidding date.

equirements for bidding: This ral form sets forth the manner of aration of the proposal, qualifica- for bidders as individuals or orations, rejection of proposals, ution of contract and surety bond sum equal to the aggregate unt of the contract, a five percent deposit, examination of the site, tification of the documents, settle- of the federal excise tax refund a listing of priority preference gs.

oposal: The proposal form lists etail the work required of the er under the eight main items ibed in the specifications. This osal contains spaces for prices ll items, both unit prices total prices, and includes gnature page for the official tures and corporation seals of bidders. The paragraphs follow- the total prices, but above the ture of the bidder, require a ment that the bidder's proposal sed on his own knowledge and mation obtained at the site and the plans and specifications, the required for completion in dar days, acceptance of condi- for extras and credits based unit prices, the basis of payment measured quantities, his state- that all costs are included, and amount of certified check de- ed to guarantee acceptance of d.

itial covenants: Introductory of the agreement between the district and the contractor, with and numbers of all drawings in- d in the contract documents, ncluded under this heading.

finition of terms: A short stand- form defining agencies, officials, contractors, work, site, datum, A.S.T.M. and federal specifications and other terms used in the specifications.

General provisions: This general form covers the subjects listed in Table II, as included in all work contracts.

General conditions of contract: This contains statements covering the subjects listed in Table III, as included in all work contracts.

Special provisions—work sheets: These provisions will vary with each job, but for the breakwater pier under discussion, cover the following subjects.

5-1 Scope of work. This includes three pages describing all items included in the proposal.

5-2 Location of work.

5-3 Work or material not included. Certain large stones for breakwater cap furnished by others at the site.

5-4 Time schedule and order of procedure.

5-5 Condition at site.

5-6 Access to site.

5-7 Basic assumptions: This item describes the basis of adjustments for deviation from the plans when ordered by the engineer, the percentage of the volume of stone allowed for vertical joints to be filled with concrete grout at a unit price per cubic yard of concrete, and conditions for the use of wood piles, timber wales, tie rods and stone fill as existing at the site before the work is begun.

5-8 Contractor's office and shelters.

5-9 Contractor and sub-contractor.

5-10 Protection of utilities.

5-11 Protection against damages.

5-12 Protection of the public.

5-13 Refuge from storms.

5-14 Time of completion.

5-15 Datum and bench marks.

5-16 Misplaced materials.

5-17 Safety requirements.

5-18 Obstructions.

5-19 Inspection.

5-20 Electrical energy and water for construction purposes.

5-21 Excavation.

5-22 Wrecking and alterations: This item describes in detail all work on the existing piles, timbers, tie rods and stone fill and the wrecking, re-

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TABLE I — TABLE OF CONTENTS FOR SPECIFICATIONS FOR PIER WORK

	Form No.	Page No.
Advertisement	.....	1
Requirements for Bidding and Instructions to Bidders	1,018	2 to 4
Proposal	.....	5 to 14
Contract and Specifications		
Section I. Initial Covenants	.....	15 to 16
Section II. Definition of Terms	999	1 to 2
Section III. General Provisions	1,068	1 to 5
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Included Specifications for Concrete Masonry	.....	1 to 25
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TABLE II — SUBJECTS TREATED IN GENERAL PROVISIONS OF CONTRACT

Powers of the engineer
Copies of drawings furnished
Additional plans
Shop drawings
Checking plans
Drawings and specifications on the work
Ownership of drawings and models
Samples
Interference
Examination of site
Cleaning the site
Measurement for payment
Plant, procedure, methods and equipment
Lines and grades
Inspection and testing of materials and equipment

TABLE III — ITEMS COVERED BY GENERAL CONDITIONS OF CONTRACT

The contract and contract documents
Correlation and intent of documents
Right to terminate contracts
Access and inspection of work
Duty of contractor
Contractor's responsibility
Relations of contractors and sub-contractors
Separate contracts and cooperation
Royalties and patents
Permits and regulations
Advertising
Sanitation
Competent foremen, superintendents and employees
Contractor's insurance
Use of premises
Contact with adjacent property and structures
Protection of work and property
Watchmen
Maintenance of order
Payments
Changes in the work
Claims for extras
Emergencies
Correction of work before final payment
Correction of work after final payment
Determination and extension of contract time for completion
Failure to complete work on time
Liens and suits
Veterans' preference
Assignments
Right to decide questions

moval and alteration of the existing pier in preparation for the new work.

5-23 Iron work.
5-24 Timber wales.
5-25 Stone fill.
5-26 Setting capstones and grouting.
5-27 Setting precast concrete.
5-28 Concrete work.
5-29 Expansion joints.
5-30 Riprap.
5-31 Removal of equipment.
5-32 Priority preference rating.

Specifications for masonry: Standard specifications of the type added by the park district in all contracts requiring concrete work.

Prices and final covenants: This section is not filled out by the bidder, but contains a recapitulation of the items and price blanks as included in the proposal. It becomes a part of the contract with the prices filled in after the award of contract and previous to its signature by either party. The last page includes blank lines for signatures of the executive officers of the owner, the contractor and the approving officials of the owner.

Contractor's bond: A short standard form.

As no two construction jobs are the same, every project will require careful study of a check-list of all items occuring in the work to avoid the omission of anything that could cause additions to the contract prices as extras.

Added help may be obtained by use of the following: Catalogues filed under the standard filing system American Institute of Architec Section IV, Specification of Feder Stock Catalogue, U. S. Treasu Dept.; Parts I, II, III, of A.S.T. Standards; Parts I and II of Hig way Materials, American Associati of State Highway Officials; Swee catalogue file, and the manual the American Railway Engineeri Association.

To summarize, good specificatio may be written by anyone who li to study and write, and who has h experience as a draftsman, superi tendent of construction, structur designer, architect or engineer. How ever, legal aid may be necessary make the contract "hole-proof a air-tight."

A Municipal Rate Schedule For Industrial Waste Treatment

Contents in Brief—*Increased operating cost at the New Brunswick, N. J. sewage treatment plant due to industrial wastes has led the city to inaugurate special charges for providing disposal service. The municipal ordinance sets forth rates, the manner for measurement of flow and the means to be used for determining waste characteristics.*

INDUSTRIES that discharge their wastes into the New Brunswick, N. J. sewer system must now pay a special charge for this service, the rates being based on a schedule reflecting the volume of flow, solids content and chlorine demand of the waste.

This unusual rate schedule for industrial waste discharges, which was adopted by municipal ordinance early this year, is expected to defray in large measure the additional operating costs at the disposal plant caused by industrial waste contributions. Revenue from industries is estimated to gross about $45,000 annually, this amount representing about half the cost of operating the municipal disposal plant. The latter provides chemical treatment, sedimentation, vacuum filtration of raw sludge and effluent chlorination. Dewatered sludge is hauled away for application to farm land.

The three-part rate schedule, which was recommended by Elson T. Killam, consulting engineer to the city, is intended to provide a fair measure of the treatment "load" placed on the plant from different types of industrial waste. Each industry must pay a charge based on rates of $22 per million gallons of flow, $5 per ton of solids in the wastes, and $5 per 100 pounds of chlorine demand exerted by the wastes. Thus, an industry that contributes a waste equivalent to twice the strength of domestic sewage (New Brunswick sewage strength averages 180 ppm. solids and 15 ppm. chlorine demand) would pay about $42 per million gallons of flow treated.

Operating costs increased

According to Chester W. Paulus, mayor of the city, New Brunswick was forced to take this action because excessive waste discharges from war production industries had greatly increased operating costs at the city's chemical-mechanical type treatment plant. "This additional cost", said Mayor Paulus, "cannot justifiably be charged to the tax-paying public."

Major elements of the ordinan are set forth in the following abstrac

So far as practicable—industri wastes may be discharged into t city sewer system—with a minimu of, or without pretreatment—pr vided the consent of the Board Commissioners of the City of N Brunswick is first obtained, and t rules, regulations and charges pr scribed for the treatment of industri sewage are complied with.

Determination of charges

The charges for factory effluents industrial wastes discharged into t city sewers or tributaries thereof, sh be determined on the basis of flo suspended solids and chlorine d mand, according to the followi schedule or rates: $22 per million g lons; $5 per ton sludge solids; $5 p 100 lb. chlorine demand. The charges shall be payable and bill quarterly on the first days of Jan ary, April, July and October of eac year, and shall be a lien upon t premises connected with the sewer sy tem until paid.

Before factory effluent comprisi wastes other than domestic sewage ca be discharged into the municip sewer system, the following rules, re ions and conditions must be com- d with:

a) Industries shall at all times co- rate by adopting such schedules of harge as will—without interfering factory production—minimize concentrations.

b) In the event that the materials, micals in, or characteristics of, tes from any industry, interferes the efficiency of operation of the icipal plant, or unduly increases cost thereof, then the industry l—by reducing its peak dis- ges, by construction of equalizing s, by partial pretreatment by elim- ion of troublesome wastes, or by r approved means — produce tes of acceptable quality before harge to the city system.

c) The extent of difficulties and to egree the cost of handling the tes from one industry may be igated or aggravated by wastes n another industry. Accordingly, not deemed practical to set at time, any numerical standards or itations on concentration or qual- Therefore it is the intention of e rules and regulations to allow imum latitude in the use of the icipal system—and to require rol or special procedure by indus- only in such cases as the failure o do would seriously affect the ration of the municipal plant or ld entail unwarranted expenditure he plant.

Measurement of flow

ach industry for which estimated ges will exceed $1,000 per year l install a suitable device for con- ously recording the flow dis- ged to the city system. Plans for plete metering installation shall be mitted to the city for approval.

the case of industries for which otal annual charge is estimated to ess than $1,000—the volume of used in computing charges shall based upon metered water con- ption.

the event that evidence is pre- d indicating that more than 20 ent of the total annual volume of r used for all purposes does not h the sewer, an estimate will be e of the proper amount to be cted.

here industries have a private r supply—all or part of which is arged to the sewer—the amount uch supply or the part thereof discharged to the city system shall be metered and included in the charges made.

Means shall be provided at each plant to allow periodic determination of the character and concentration of wastes as a basis for charges for sludge solids and chlorine demand. Such determinations will be made at least twice a year; or, if deemed necessary, quarterly, immediately prior to the date of quarterly payments.

Determination of character of the wastes will be made by the city and shall be binding as a basis for charges. Samples shall be collected in such manner as to be truly representative of the actual quality of waste, and standard methods of analysis will be used.

In the event that the character of the wastes as discharged do not provide representative data as to actual costs—then charges shall be based upon full scale tests at the municipal plant or upon estimates based upon representative data.

Finally, it is provided that any person, firm or corporation who shall violate any of the provisions of this ordinance shall be subject to a fine of not exceeding two hundred dollars or imprisonment for thirty days, or both, in the discretion of the magistrate; each day that a violation is permitted to exist, shall constitute a separate offense.

Subway Proposed for Havana, Cuba

A modern subway to carry the million inhabitants of the Havana metropolitan area to and from work is the solution to that city's growing traffic and transportation problems suggested by Pablo Llaguno de Cardenas, Cuban engineer. Cost of the proposed project would be $200,000,000.

Writing in *Seguros, Banca y Bolsa,* a magazine of business and industry published in Havana, Mr. Llaguno de Cardenas says that the 10-year project would bring incalculable benefits to the capital area by speeding passenger traffic under the sprawling maze of narrow, winding old streets in the heart of the city, instead of piling up within them.

Pointing out that the central part of Havana is almost entirely lacking in arterial highways designed for automotive traffic, and that the picturesque, but ancient streets of the Infanta, Cerro, Ayestaran, Puentes Grandes, Vibora, Jesus del Monte and Calzada de Concha districts are an almost impassable barrier to surface traffic, Mr. Llaguno de Cardenas adds that a subway would solve the transportation snarl and help suburban development by bringing any part of the metropolitan district within 30 minutes travel of the center.

Suburban development is one of the chief benefits to Havana's crowded citizenry foreseen by the engineer in his plan for a subway swinging in a wide arc through the heart of the capital. By connecting with existing surface suburban lines, the underground would bring outlying areas within easy reach of the central financial, commercial and industrial districts, and make it possible for thousands of workers to exchange their present unhygienic dwellings for low-cost, modern housing on the outskirts of the city.

Passing through the Concha, Luyano, Jesus del Monte, Acosta, Cerro, Puentes Grandes, Zanja and Calzada de Infanta districts, the subway would go under the harbor by means of a tunnel to Regla, there to connect with an interurban surface line to Guanabacoa and other communities. Although the fill-ins and soft subsoil on which many parts of Havana are built might present tricky construction problems, the Cuban engineer estimates that cost of the subway would be much less than the $1,786 per foot which he estimates New York City spent in boring through the rocky foundation of Manhattan for its new underground.

As Mr. Llaguno de Cardenas sees it, subway construction is the only answer to a surface transportation and parking problem which is growing daily more tangled and insurmountable. He opposes demolishing thousands of houses for new arterial highways as unfeasible and economically unsound, and points to the experience of Madrid and other old European cities in experimenting with such a plan. After a short time, he says, these cities were forced to abandon the project because of its cost and negligible contribution to solving their transit problems.

Ground Dewatering for Construction

Part II—Methods Available and Their Application

Ross Nebolsine
President, Ranney Water Collector Corp., New York, N. Y.

***Contents in Brief**—Adaptability of wellpoints, vertical wells and horizontal wells to various drainage problems is outlined briefly. For the first time a description is given of the application of horizontal drainage to areas where permeable strata extends only a short distance below the level to be unwatered. Dewatering for construction of the Brooklyn end of the Brooklyn-Battery vehicular tunnel in New York City by horizontal wells is used to illustrate the principles.*

THERE ARE THREE BASIC METHODS of subsurface dewatering for construction projects — wellpoints, vertical wells or shafts and horizontal drainage systems. Applications of the first two were described in an earlier article (*ENR*, April 6, 1944, Vol. p. 479), which traced the development of ground dewatering for the 100 years since its inception. In some cases any one of the three meth can be used with only minor di ences in cost and in results achie Usually, however, there are co tions that make one scheme be than another for a particular site.

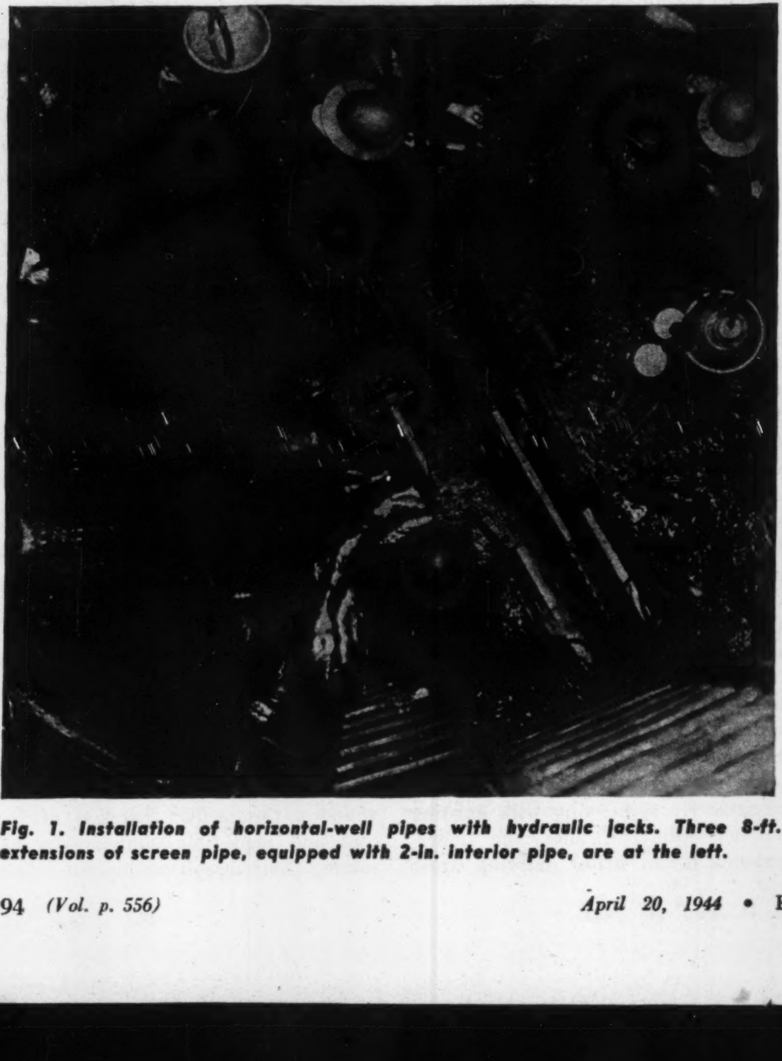


Fig. 1. Installation of horizontal-well pipes with hydraulic jacks. Three 8-ft. extensions of screen pipe, equipped with 2-in. interior pipe, are at the left.

Wellpoints are easily installed the equipment required can be ren This system is readily adapta where the site is accessible from sides and where the water bear strata to be drained is not too de For most small jobs wellpoints the most practical and economi means of dewatering. They are s able on large projects where the w table need not be lowered very and for all open-cut work in wa bearing material. Wellpoints can used to depress the water table i series of steps, each tier accoun for about 15 vertical feet.

Vertical wells are suitable wh adequate submergence is availa that is, where there is a consider depth of permeable material be the level to which the water table to be reduced in which to place well screens and pumps. In contr to wellpoints, a dewatering sys consisting of deep wells can be i stalled and drainage effected to full depth required ahead of exca tion and outside the zone of the co struction operations to be perform Knowing in advance of major ope tions how much the water table ac ally has been depressed, full adva tage can be taken of any econom in procedures and equipment that m result therefrom.

Horizontal drainage offers a mea of dewatering where it is desira to avoid open-cut work and subm gence is inadequate, i.e., when underlying impermeable formation close to the level to which the grou water is to be reduced. Operat submergence is the depth of wat bearing strata below subgrade in

d work area from which wells
aw. This determines whether
wells can be used or whether
ore complicated horizontal
e will be more effective and
sult in greater overall econo-

horizontal drainage may be
d in either of two ways. The
method was to drive tunnels in
er stratum, which may be suffi-
hemselves for drainage or may
wellpoints driven from the
A newer method, developed
Ranney, has for its basic
le the projection of long hori-
screen pipes by means of a
digging head from a shaft to
he horizontal drainage system.
latter scheme requires the sink-
one or more shafts to the im-
s layer below the strata to be
and the projection of horizon-
ravel-surrounded, perforated
pipes radially from the well.
ay be extended 200 ft. or even
n any direction from near the
of the shaft. This radial well
was developed for use in
upply systems to secure a
volume of water from shal-
ata of water-bearing material
Oct. 22, 1936, p. 576 and July
1, p. 155) and has only re-
been adapted to construction.

ubsurface data essential

proper approach to a complex
ring problem is to first make a
hensive hydro-geological study
site. When the water may have
ntercepted somewhere between
nstruction site and the source
ply, or where the lowering of
ter table may affect adjacent
ties or interests, the area that
e investigated will be quite ex-
. Final selection of the system
sed may require a comparative
estimate of cost of installation and operation, also evaluation of the extent of drainage and attendant economies it is possible to achieve with each available method.

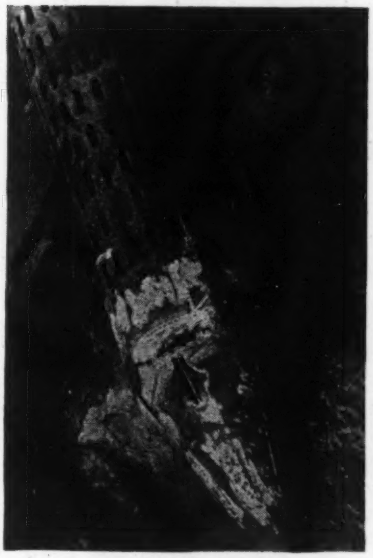


Fig. 2. Boring head of the screen pipe of a horizontal well. During the placing operation, the water, with the fine material that is entrained, is admitted only through slots in the boring head.

Basic data for estimating are obtained by studying the property limitations of site, its topography and accessibility. Sub-surface conditions can be judged by means of test borings, geophysical observations and pumping tests. Factors to be considered are perched water tables, difficulty of adequate exposure of water-bearing ground, pumping and water disposal.

The importance of a sufficient number of test borings, properly located, of sufficient depth and executed by skilled operators, cannot be overemphasized. None of the projects studied by the author originally had adequate test boring data. A mistake commonly made is to omit testing the ground surrounding the construction site entirely. Even if access difficulties arise, a way usually can be found to obtain permission to sink the holes or to locate them in other adjacent private properties or public areas. A frequent deficiency in data results from stopping the test holes at elevations just below the bottom of the structures to be built. Knowledge of the physical conditions below the structure is often most important. No estimate of draw-downs and probable pumping rates can be made unless data are available on the depth and character of the soil to the underlying impermeable formation.

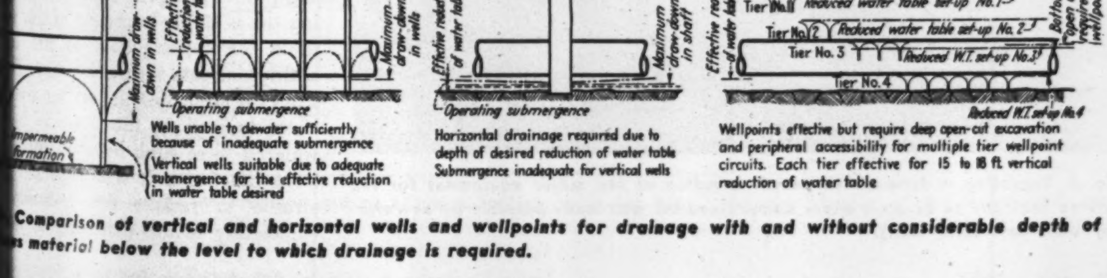
The need of adequate submergence for successful dewatering operations by means of vertical wells arises from certain hydraulic factors that are not generally appreciated. The actual piezometric line adjacent to even a new and unclogged vertical well or wellpoint for maximum pumping rates usually is much steeper than theoretical computations indicate. Besides the head required for the inflow of the water to the well according to the Darcy law, additional pressure head is used up by:

(a) Velocity head and friction losses within the well casing.

(b) Turbulent rather than laminar flow through the well screen openings and through the adjacent coarse material.

(c) Larger friction losses in the porous medium due to the presence of entrapped air and partial liberation of dissolved gases.

(d) Additional loss of head close to the well, where there is a large vertical component to the velocity of approach, because the coefficient of permeability is not the same for different directions of flow in most natural formations.


iginal water table
Maximum draw-down in wells
Impermeable formation
Original water table
Effective reduction of water table
Maximum draw-down in wells
Operating submergence
Original water table
Effective reduction of water table
Maximum draw-down in shaft
Operating submergence
Original surface of ground
Original water table
Effective reduction of water table
Tier No. 1
Reduced water table set-up No. 1
Tier No. 2
Reduced water table set-up No. 2
Tier No. 3
Reduced W.T. set-up No. 3
Tier No. 4
Reduced W.T. set-up No. 4
Bottom of open cut required for wellpoints

Wells unable to dewater sufficiently because of inadequate submergence

Vertical wells suitable due to adequate submergence for the effective reduction in water table desired

Horizontal drainage required due to depth of desired reduction of water table Submergence inadequate for vertical wells

Wellpoints effective but require deep open-cut excavation and peripheral accessibility for multiple tier wellpoint circuits. Each tier effective for 15 to 18 ft. vertical reduction of water table

Comparison of vertical and horizontal wells and wellpoints for drainage with and without considerable depth of s material below the level to which drainage is required.

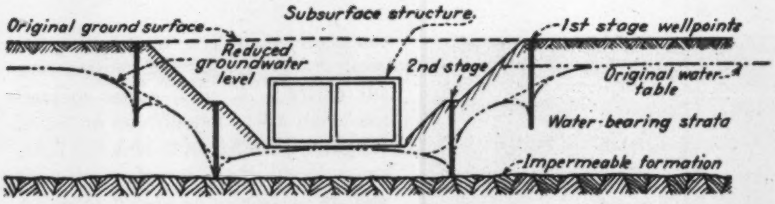


Fig. 4. Wellpoints are effective and efficient where open cut method of construction is contemplated. Here submergence is insufficient for vertical wells.

The phenomena described above explain, in part at least, why so much head is used up in the immediate vicinity of vertical wells or wellpoints when they are pumped to capacity. For cases where the water table has to be drawn down close to the bottom of the water-bearing strata, i.e., where adequate operating submergence is lacking, the exposure and drainage of the aquifer must be developed in a horizontal plane.

Brooklyn-Battery Tunnel

As an example of how effective drainage of the ground improved the physical conditions and thereby simplified the construction procedures, work on an approach to the Brooklyn Battery Tunnel at New York may be cited. Work on that vehicle tunnel was begun in 1941 but was shut down due to the war after the operations described in the following had been carried out.

In the early stages of that project, the George H. Flinn Corp., contractors under the New York City Tunnel Authority for the Brooklyn end, were confronted with a difficult problem. From two 38 x 45-ft. construction shafts twin 31-ft. dia. shield-driven cast-iron-lined tubes were to be driven along and under Hamilton Avenue and Buttermilk Channel into solid rock off Governors Island about 2,600 ft. away. Starting at an elevation in the construction shafts that provided only 10 ft. of cover, the tunnels are on a downward gradient of about 3½ percent. The invert of the tunnels intersects the underlying clay at a depth of 70 ft., some 700 ft. back from the river bank, but the top of the tunnels does not penetrate the clay until it reaches a point under the pierhead line, about 350 ft. outshore.

It was necessary to tunnel through overlying water-bearing sand, which had inadequate depth of pervious
ground below the grade of the tu
for installing vertical wells. T
tunnels had to be driven in such a
as not seriously to disturb the s
pavement and utilities and the s
tures under which they penetr
and also not to produce subsid
that might crack or damage build
adjacent to the work.

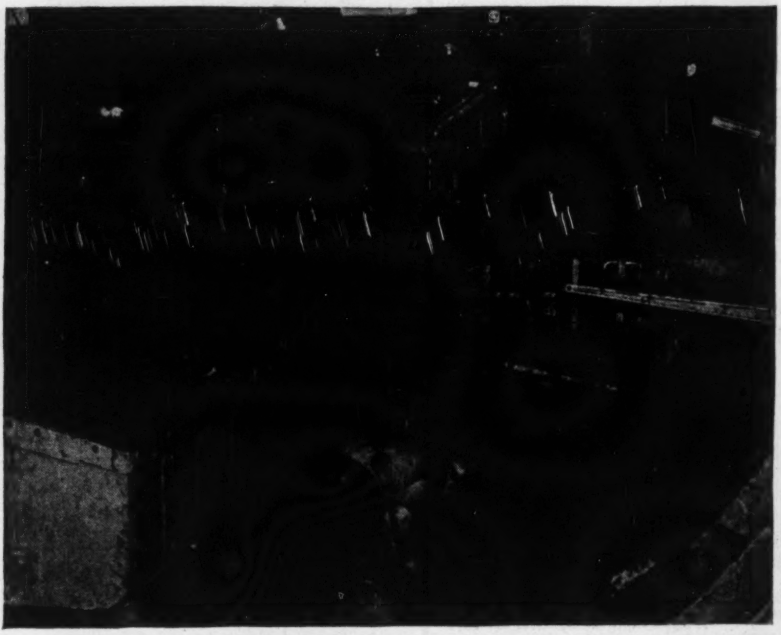


Fig. 5. Tunneling in free air to permit erection of the major equipment for the driving that had to be done under compressed air was made possible by dewatering with horizontal wells.

Hydro-geological conditions

The general location of the Br
lyn end of the tunnels is show
Fig. 3. The ground encountered
sists of about 10 ft. of pervious
over a stratum of river silt, clay
a thin layer of peat. Underlying
relatively impervious layer is a t
bed of fine gray, water-bearing s
which changes to brown color and
comes slightly coarser towards
bottom. Underlying the sand is
impervious bed of glacial clay,
top of which is at about El. 240.
iginal water table was at El. 29
the construction shafts while m
high water is El. 300 and the gro
at El. 308. These are assumed
vation, mean sea level at New Y
being taken as El. 300 to avoid w
ing in negative elevations.

No special test pumpings of
area along the tunnel line had b
made. Three vertical dewater
wells and wellpoints adjacent to
already excavated construction sh
indicated that the submergence av
able for pumping was scant.
vertical gravel-packed wells, with
in. dia. screens 25 ft. long, loc
close to the two construction sh
were able to lower the water t
inside the shafts only from El. 29
275. As the bottom of the shafts
at El. 259, 130 wellpoints were dr
down from inside and around e
shaft and after a month of pump
the water level was brought down
the required subgrade.

The general area had been explo
and studied for the Tunnel Autho
by Prof. Chas. B. Berkey and Thom
W. Fluhr. However, for planning
comprehensive dewatering layo
computing pumping rates and esti
ing the possible lowering of the wa
table for construction of the tu
additional data were necessary. The
fore, on advice of the writer five
holes located in the area to be
watered were sunk by the contrac

In this work it was especially
sirable to reduce the groundw
sufficiently to avoid having to ins

lkhead and locks in the construc- shaft and to make possible the ing of some 300 ft. of the tunnel ee air to permit erection of the r tunneling equipment prior to ling bulkheads and locks in the el itself. As there was to be no cut, wellpoints were impractical observations of the shaft pumpindicated that vertical wells were suitable.

Horizontal drainage

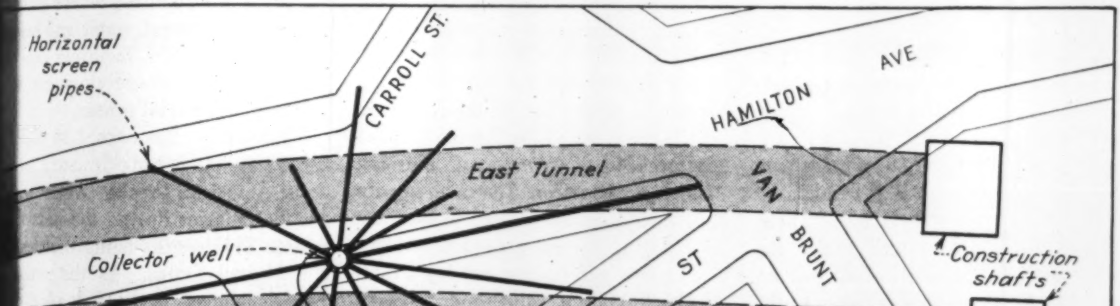
fter a study of the whole problem writer, with the assistance of Alf rt, the contractor's chief engineer, with the cooperation of engineers he Tunnel Authority, designed a al well for installation between two tunnels and about 300 ft. rward from the construction ts. Its purpose was to reduce the r level to below the tunnel invert some 350 ft. from the shafts.

A circular 11½-ft. inside diameter reinforced concrete caisson with 14-in. thick walls was sunk by open excavation. Caisson weights were used to avoid necessity for undermining, which might have permitted settlement of adjacent buildings. Clay was encountered at El. 240 and bottom of the caisson was stopped at El. 237. A reinforced concrete plug was placed by tremie method to seal the bottom.

As soon as the caisson was unwatered, 8-in. dia. screen pipes were projected through portholes provided in the walls of the shaft at El. 242.5, as close as practicable to the top of the clay strata.

The digging-head method of installation of screen pipes was used. This is accomplished by forcing a bullet-nosed boring head with slots in it outward into the pervious strata. Hydrostatic head forces water through the slots, carrying fine materials with it, while the coarse materials are left in place to form a filter for permanent operation. Inside the 8-in. pipe a 2-in. pipe is temporarily installed to take the flow coming in through the boring head while flow through the main screen pipe is prevented by an annular ring between the two pipes. To prevent the possibility of settlement of the surrounding ground, which might occur if excessive amounts of fine materials are removed by the flow through the horizontal screen lines, an inner thin screen of 7-in. dia., with smaller slots, is provided.

Twelve screen pipes totalling 1,100 lin. ft. were installed on the Brooklyn-Battery project providing a submerged screen area of about 2,400 sq.ft. As shown in Fig. 3, the pipes in plan covered an elliptical area, the long axis of which corresponded with the route of the tunnels.


Horizontal screen pipes
CARROLL ST.
HAMILTON
AVE
East Tunnel
VAN
BRUNT
ST.
ST
Collector well
Construction shafts
West
Tunnel
IMLAY ST.
SUMMIT
N
Pierhead line
Dewatering shaft
Work in free air
425'±
Construction shaft
3 vertical dewatering wells and 130 wellpoints adjacent to construction shafts
Test holes
Test holes
Hamilton Ave.
El. 300
M.H.W.
Fill
Normal water table
300
Fine sand
Horiz. screen pipes
250
Fine and coarse sand
250
31 ft. dia. tube
Stratrified silt and clay
Water table after pumping
200
200
Stratrified sand & gravel
Some clay and boulders
Gneiss
Brooklyn injection gneiss
Sta. 90+00
100+00
110+00

. 6. Plan and profile of Brooklyn end of Brooklyn-Battery vehicular tunnel showing location of horizontal wells and ct of drainage.

The shaft was equipped with three vertical-turbine well-pumps having a total capacity, including the stand-by, of about 5,000 gpm. After two days of pumping, the general level of the watertable in the area between the radial well and the construction shafts dropped from El. 285 to 260. By dropping the suction lines of the pumps in the radial well to the lowest point, it was possible to hold the water in the shaft to El. 243, pumping 2,500 to 3,000 gpm. Outside the shaft, due to the large screen area available close to the bottom of the water-bearing ground, the cone of depression was quite flat despite an operating submergence of only 3 to 6 ft. In the steepest direction the water level rose about 12 ft. in 100, which was about half of the rise away from the construction shafts when the ground was being drained by the three vertical wells and 130 wellpoints with a submergence of 20 ft.

Free air for 425 ft.

Lowering of the water table permitted driving the east tube 427 ft. and the west tube 422 ft. in free air. In October 1942, when construction was suspended due to War Production Board action, the east tunnel had been driven 1,220 ft. to well under the river with air pressure of 25 psi. instead of the theoretical 31 psi. In the west tunnel, which had advanced some 600 ft. less, the air pressure was 14.5 psi. instead of 21 psi. Because of these conditions, and despite the shallow cover of the mostly pervious ground over the tunnels near the construction shafts, no trouble from escaping air was experienced. When the work was shut down the headings were bulkheaded, pumping of groundwater discontinued and the watertable re-established itself.

The Brooklyn-Battery tunnel is being constructed for the New York City Tunnel Authority and work is to be resumed as soon as materials and labor are again available. Ole Singstad is chief engineer and W. D. Coe, division engineer on the Brooklyn end. Geo. H. Flinn Corp. are the general contractors. The dewatering operations were planned and supervised by the writer.

Conclusion

The accomplishments of the past in ground dewatering represents only part of what can be achieved in the future, if the various factors involved are understood and sufficient economic incentives are permitted to develop. The location, design and method of building an entire tunnel, drydock or similar structures in water-bearing ground may sometimes depend on the practicability of lowering the water table sufficiently over the projected work area.

Reduction of air pressures decrease the danger of blow-outs where the cover is thin. The health hazards involved when working under high pressure are well known and pressu usually are limited to 50 psi. restri ing the depth at which it is possi to work. Extra compensation in creased pay and reduced work time, even down to one hour a d give reduction of working air pr sures an important economic co sideration. Any improvements in watering techniques corresponding extend the possibilities of subaqueo construction.

Sanitation Work Extended In Latin America

Six Latin American republics have recently concluded new agreements with the United States for extension of the inter-American health and sanitation program. They are Brazil, Mexico, Colombia, Peru, the Dominican Republic and El Salvador.

The agreements are the first to be made for extension of the program which grew out of the Rio de Janeiro Conference of American Foreign Ministers. Nineteen American republics, including the United States, are cooperating in this program.

The new agreements call for a total of $16,250,000 in joint funds to carry on health and sanitation projects in the six republics to the south. Of this sum more than half is to be contributed by the other American republics and the balance by the United States, through the Institute of Inter-American Affairs, an agency of the Office of the Coordinator of Inter-American Affairs.

The Brazilian agreement sets up a joint fund of $8,000,000 over the next five years largely for continuance of projects in the Amazon and Rio Doce Valleys (*ENR* Dec. 30, 1943, p. 954) in support of economic developments under way there. Brazil is underwriting $5,000,000 in this fund and the United States the rest.

The arrangement with Mexico calls for equal contributions towards a $5,000,000 fund for health work to be carried on for the next five years. The cooperative work in Mexico, as projected, includes provision of additional health facilities along the route of the Inter-American Highway.

The Peruvian extension is for three years and provides for a joint fund of $1,000,000 made up of equal co tributions of $500,000. The new fun will enable Peru to extend work the Amazon basin and at Chimbo on her northern coast, where proje for malaria control, water and sewa systems and other facilities are ai ing in the town's development as port and industrial center.

El Salvador has agreed to contri ute $300,000 for continuance of Inter-American health work with her boundaries during the next thr years. This sum is being matched the United States. As the progra has developed in El Salvador, co tributions by the Federal governme of El Salvador have been supp mented in many instances by co tributions from municipalities.

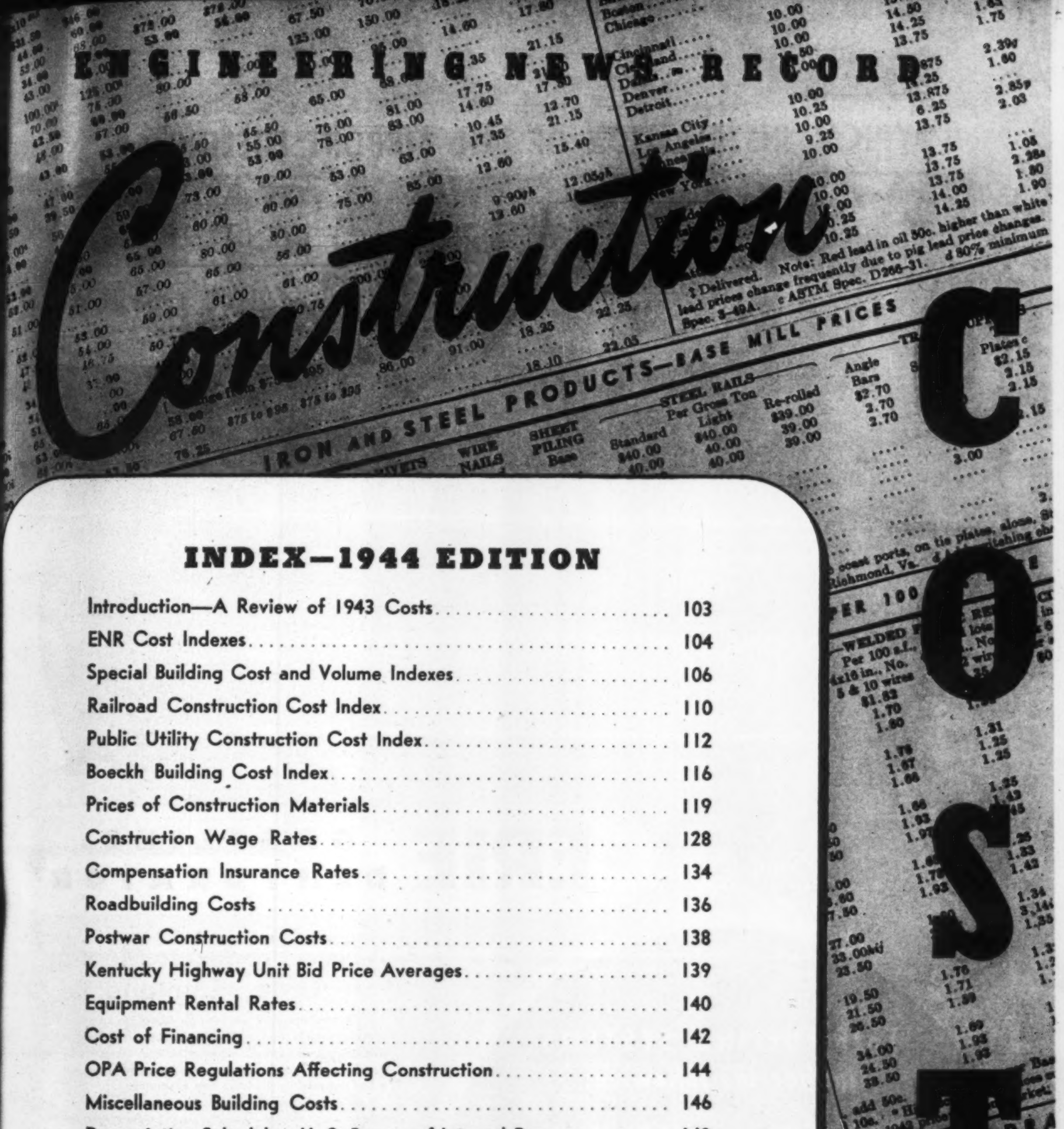
The pact with Colombia provid for equal contributions of $600,00 to carry on for a two-year peri projects for the training for pub health personnel, for operation an construction of health centers an dispensaries, and for malaria contr Much of the work in Colombia located in regions producing rubbe balsa and quinine.

The agreement with the Dominica Republic is for a 3-year period. U der its terms a joint fund of $450,00 is to be set up, to which the Unite States is to contribute $300,00

All cooperative work under th new agreements will continue to carried out by the special cooperati health services organized in eac country. These services are head by a United States doctor or sani tary engineer and staffed largely public health technicians from amo nationals of the other Americas.

ENGINEERING NEWS-RECORD

Construction COSTS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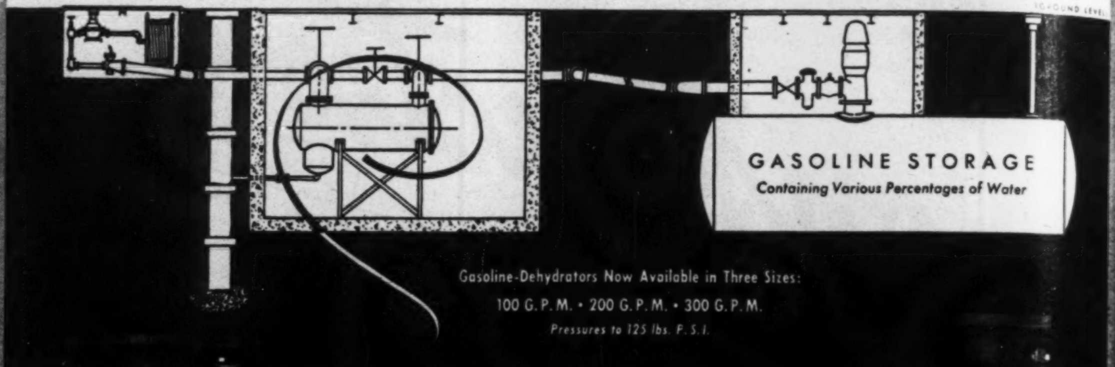
Work data for engineers and contractors concerned with planning, estimating, bidding, cost control, appraisal and valuation

TYPICAL INSTALLATION OF ERIE AIRPORT FUELING SYSTEM



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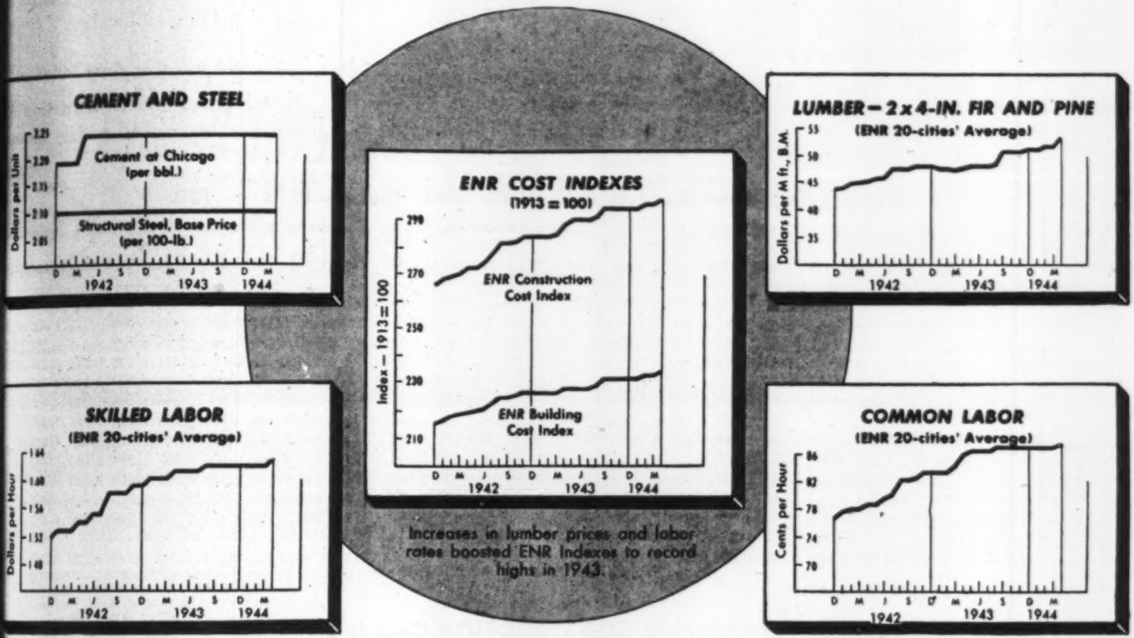
Introduction to

Construction Costs

1944 Edition



Increases in lumber prices and labor rates boosted ENR indexes to record highs in 1943.

HE COST OF CONSTRUCTION, continu- g its gradual rise in 1943, by De- mber had climbed 3.9 percent over e January, 1943 value. Higher labor tes and increased lumber prices ere the factors that sent the *ENR* onstruction Cost Index up to its cord high of 294.51 in December.

The common construction labor mponent climbed 4.5 percent dur- g the year while the skilled labor ctor went up 0.9 percent. Lumber se 7.0 percent, but other material mponents, cement and steel were nchanged during the period.

The rise in construction costs, how- er, was topped by gains in other anches of the nation's price struc- re. Hourly labor rate averages in manufacturing industries (Na- onal Industrial Conference Board) creased 7.8 percent for skilled and mi-skilled labor, 5.7 percent for mmon manufacturing laborers dur- g 1943.

In materials, the Bureau of Labor atistics Index of Wholesale Prices recorded a 1.1 percent gain for building construction materials in 1943 compared with 1942. The increase in all commodities was 4.4 percent, while gains in six of the ten commodity indexes exceeded the building material price index rise.

Factors not measured by material and labor price quotations continued to add to contractor's costs in 1943. Builders whose work was in war production centers had to compete with manufacturers for labor, or accept the lower efficiency of less skilled workers. Material shortages necessitated the use of substitutes, or increased freight for longer hauls in areas of local shortages. In the case of lumber, in many instances, lower-grade stocks had to be accepted at higher-grade prices in mixed shipments if the orders were to be filled.

In the opening four months of 1944 the steady rise in construction costs continued. The April *ENR* Construction Cost Index value, 297.70, was at a new high as a result of higher lumber price ceilings and WLB-approved wage rate increases. Cement and steel remained unchanged, but higher steel prices are anticipated if the War Labor Board approves a wage increase for workers in the steel-making industry.

Postwar construction costs are expected to start off at approximately current, or 1943-'44, values. New competitive conditions will exist, influenced by greatly increased capacities for producing the light metals, by the price reduction in aluminum, and by the increased productive capacity for steel, especially steel alloys. Construction site labor, chiefly responsible for construction cost increases, will meet increasing competition with off-site pre-fabrication and sub-assemblies unless new field methods are devised to make site labor more efficient. But lumber, with an April, 1944 price 74 percent higher than its September, 1939, 20-cities' average, probably faces the most painful postwar adjustment.

ENR Construction Cost Index

THE ENGINEERING NEWS-RECORD Construction Cost Index has four components: (1) structural steel shapes, base price; (2) cement at Chicago; (3) lumber, which until 1935 was 12 x 12 long leaf yellow pine wholesale at New York, and since 1935 is 2 x 4 S4S pine and fir in carload lots, *ENR* 20-cities average; (4) common labor, *ENR* 20-cities average of wage rates in force.

The weighting for the original price series is given in the following computation for December, 1934:

Steel	25 cwt. x 1.80 =	45.00
Lumber	0.6 x 61.00 =	36.60
Cement	6 x 2.00 =	12.00
Labor	200 x .5413 =	108.26
Index		201.86

The weighting for the new lumber price series is 1.088, and the computation for January, 1944 index is:

Steel	25 cwt. x 2.067 =	51.69
Lumber	1.088 x 51.1 =	55.64
Cement	6 x 2.2 =	13.44
Labor	200 x .86 =	173.80
Index		294.57

This Construction Cost Index i designed to predict changes in construction cost trends and to measur the movement of construction co in general. It is not intended to appl to any specific class of constructio or to a particular locality.

ENR Building Cost Index

In practice, the construction co index has been used widely to appl

Engineering News-Record BUILDING Cost Index—1913 = 100

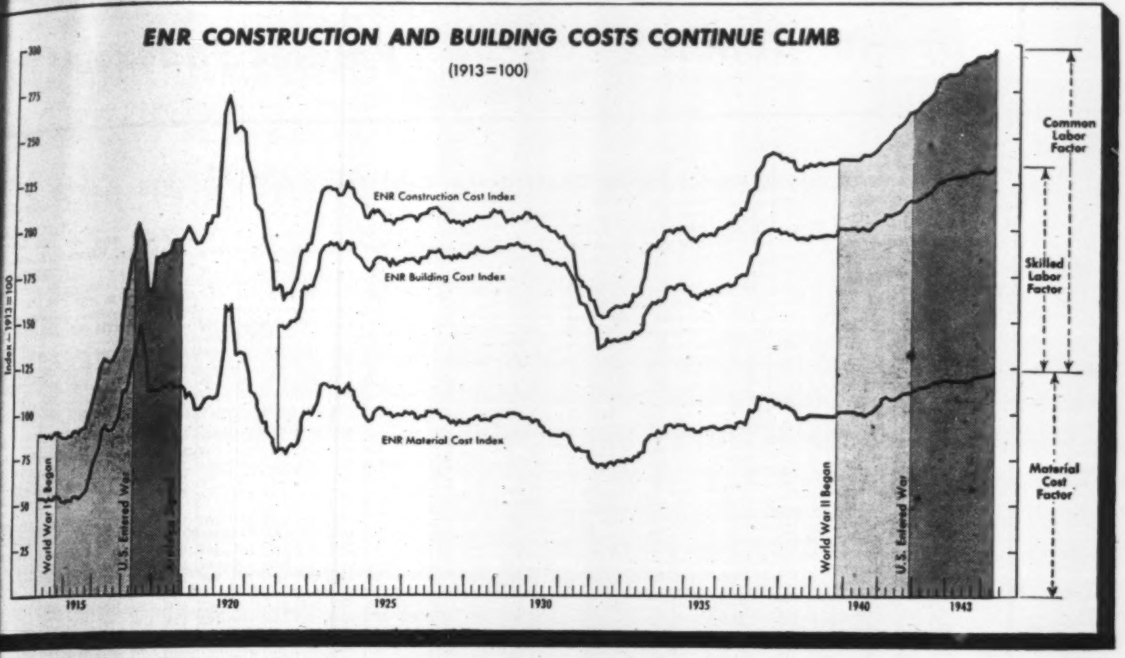
Yearly Av. 1910–'22			1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	1943†	194
1910..	96.4	J	168.2	189.3	182.7	184.3	187.8	185.9	190.0	190.3	180.7	150.6	140.8	160.2	166.5	168.3	185.5	198.6	196.2	201.5	207.9	217.1	226.9	231.
1911..	94.1	F	172.6	191.7	184.5	183.7	189.2	187.2	190.0	188.5	182.0	147.2	141.7	161.3	165.8	168.4	186.6	199.0	196.2	201.5	208.4	218.4	226.9	232.
1912..	91.4	M	178.4	194.1	184.5	184.3	187.3	187.2	190.0	189.2	180.2	145.9	140.8	161.7	164.1	169.7	187.7	199.3	196.5	201.5	207.9	218.9	226.7	232.
1913..	100.0	A	186.0	191.8	184.7	184.1	186.0	188.8	190.0	188.8	177.6	135.7	141.5	163.2	164.4	170.0	195.0	198.2	196.5	201.4	208.6	219.6	227.5	234.
1914..	91.9	M	188.9	192.5	182.8	183.6	185.4	190.1	191.3	187.9	174.6	136.4	143.9	168.2	163.3	170.3	197.2	197.9	196.6	201.2	209.2	220.1	227.6	....
1915..	95.3	J	191.3	187.7	183.0	181.8	185.8	187.6	192.0	185.4	172.5	137.6	143.2	168.2	164.9	170.2	199.2	198.2	196.4	201.7	209.4	221.2	227.7	....
1916..	130.9	J	191.4	184.5	180.2	184.3	183.9	187.6	192.0	183.3	170.5	139.5	144.3	169.2	165.3	170.9	199.8	194.4	196.8	201.7	210.2	223.5	227.9	....
1917..	166.8	A	191.5	183.3	183.0	185.1	186.5	187.6	192.8	183.7	163.1	139.4	145.9	168.4	166.2	173.9	200.7	194.5	196.5	201.7	212.5	225.4	228.5	....
1918..	159.1	S	192.2	181.4	180.5	185.1	184.6	187.6	191.6	182.4	159.5	139.6	154.5	170.1	166.1	174.3	200.6	194.8	196.6	203.1	214.6	225.5	231.2	....
1919..	158.8	O	191.0	178.4	181.8	188.0	186.6	187.6	190.3	181.8	159.5	140.0	157.1	170.2	167.3	175.3	201.0	195.5	198.5	204.0	215.9	225.9	231.3	....
1920..	207.2	N	192.4	176.5	182.4	188.0	185.0	188.0	190.3	181.8	158.3	139.5	159.0	170.2	167.3	175.5	200.3	195.6	201.2	206.2	216.5	226.6	231.4	....
1921..	166.1	D	188.0	178.4	183.1	188.0	185.1	190.0	190.3	181.8	155.0	140.0	160.7	170.2	167.2	179.3	200.5	196.1	201.2	208.2	216.4	226.6	231.5	....
1922..	154.9																							
		Av.	186.0	185.8	182.7	185.0	186.1	188.0	190.9	185.4	169.4	140.9	147.8	166.7	165.8	172.2	196.2	196.8	197.4	202.8	211.5	222.4	228.8	....

Engineering News-Record CONSTRUCTION Cost Index—1913 = 100

Yearly Aver. 1903–'13			1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
		J	89.22	87.12	112.66	167.75	184.51	198.05	206.55	237.08	168.72	191.70	217.90	210.40	207.15	211.50	203.90	209.40	208.96	194.
1903...	93.90	F	89.22	87.36	116.66	167.75	184.51	201.50	225.10	230.67	168.72	197.40	220.30	209.70	206.55	210.15	204.65	210.40	206.46	196.
1904...	87.40	M	88.97	87.66	125.16	175.66	184.51	198.05	240.85	224.27	162.04	205.25	224.70	210.20	207.65	208.80	204.65	207.78	206.80	194.
1905...	90.55	A	87.97	90.16	129.51	183.41	186.01	191.25	265.20	213.07	164.72	213.50	221.60	209.55	207.05	209.00	206.40	203.40	207.12	191.
1906...	95.10	M	88.62	90.16	131.06	187.61	186.01	191.25	268.90	210.82	164.62	216.70	222.38	207.20	207.30	206.80	207.00	205.15	205.86	189.
1907...	100.55	J	87.87	88.96	128.71	199.26	186.31	191.85	273.80	209.82	166.62	220.70	216.85	204.60	204.80	205.55	206.15	205.65	203.36	187.
1908...	97.20	J	88.12	90.51	127.96	204.01	188.65	193.65	265.65	203.82	169.70	222.10	214.40	204.60	207.80	203.68	206.65	204.77	200.95	174.
1909...	90.92	A	90.11	91.76	128.76	198.41	193.85	196.65	252.00	193.47	173.40	221.50	213.15	204.60	208.30	205.50	207.29	205.91	200.95	171.
1910...	96.33	S	90.36	93.01	131.76	190.31	193.85	202.85	255.20	188.27	185.00	221.50	211.25	202.10	208.30	203.60	207.29	207.57	199.58	171.
1911...	93.43	O	88.51	96.16	135.11	167.11	193.85	202.25	255.20	182.57	188.60	220.30	207.55	205.35	209.80	204.40	207.71	206.32	198.72	169.
1912...	90.70	N	87.26	101.06	138.16	166.51	193.55	206.85	255.32	166.32	188.60	220.90	205.70	205.95	210.80	201.98	209.46	208.46	198.54	169.
1913...	100.00	D	86.51	107.06	149.41	167.11	194.75	206.85	251.62	167.82	192.60	217.30	208.58	205.95	210.80	203.90	210.16	209.46	196.86	166.
		Aver.	88.56	92.58	129.58	181.24	189.20	198.42	251.28	201.81	174.45	214.07	215.36	206.68	208.03	206.24	206.78	207.02	202.85	181.

Engineering News-Record CONSTRUCTION Cost Index—1926 = 100

Yearly Aver. 1903–'13			1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
1926 = 100		J	42.9	41.9	54.2	80.6	88.7	95.2	99.3	110.0	81.1	92.2	104.7	101.1	99.6	101.7	98.0	100.6	100.4	93.5
		F	42.9	42.0	56.1	80.6	88.7	96.9	108.2	110.9	81.1	94.9	105.9	100.8	99.3	101.0	98.4	101.1	99.2	94.5
1903...	45	M	42.8	42.1	60.3	84.4	88.7	95.2	115.8	107.8	77.9	98.7	108.0	101.0	99.8	100.3	98.4	99.9	99.5	93.5
1904...	42	A	42.2	43.3	62.0	88.2	89.5	91.9	127.5	102.4	79.2	102.6	106.5	100.7	99.5	100.4	99.2	97.8	99.6	92.1
1905...	43.5	M	42.6	43.3	63.0	90.2	89.5	91.9	129.3	101.3	79.1	104.2	106.9	99.6	99.7	99.4	99.6	98.6	99.0	91.0
1906...	46	J	42.2	42.7	61.9	95.8	89.5	92.2	131.6	100.9	80.1	106.1	104.3	98.4	98.5	98.8	99.1	98.9	97.8	90.0
1907...	51	J	42.4	43.5	61.5	98.1	90.7	93.1	127.6	98.0	81.6	106.8	103.1	98.4	99.9	97.9	99.3	98.4	96.6	83.8
1908...	47	A	43.3	44.1	62.0	95.4	93.2	94.5	121.1	93.0	83.4	106.5	102.4	98.4	100.1	98.8	99.6	99.0	96.6	82.4
1909...	44	S	43.4	45.1	63.3	91.5	93.2	97.5	122.7	90.5	88.9	106.5	101.5	97.1	100.1	97.9	99.6	99.8	95.9	82.4
1910...	46	O	42.5	46.2	64.8	80.3	93.2	97.2	122.7	87.8	90.7	105.9	99.8	98.7	100.9	98.3	99.8	99.2	95.5	81.6
1911...	45	N	41.9	48.4	66.4	80.0	93.0	99.4	122.7	80.0	90.7	106.2	98.9	99.0	101.3	97.1	100.7	100.2	95.4	81.4
1912...	43.5	D	41.1	51.4	71.8	80.3	93.6	99.4	121.0	80.6	92.6	104.5	100.2	99.0	101.3	98.0	101.0	100.7	94.6	79.9
1913...	48																			
		Aver.	42.5	44.5	62.2	87.1	90.9	95.3	120.8	97.0	83.8	102.9	103.5	99.4	100.0	99.1	99.4	99.5	97.5	87.1



ENR CONSTRUCTION AND BUILDING COSTS CONTINUE CLIMB

(1913=100)

building costs, and when common d skilled labor rates move in simi- r trends it is a satisfactory measure relative building cost movement. However, following the low wage rates of 1932, common labor climbed much faster than skilled and reached new all-time highs by July, 1937. The increase was in the lower ranges between union and non-union. When "prevailing" wages became synonymous with union wages the gap closed up, hence the *ENR* 20-cities wage average increased more rapidly than the union rates.

To provide a more representative measure of building cost movement, the skilled labor trend has been substituted for the common labor trend in the *ENR* Construction Cost index, and the *ENR* Building Cost index computed. The labor weighting applied to the *ENR* skilled labor average for 20-cities thus becomes 68.38 hr., and the computation for the Jan. 1944 Building Cost Index is:

Steel	25 cwt. x 2.0675 =	51.69
Lumber	1.088 x 51.14 =	55.64
Cement	6 x 2.24 =	13.44
Labor	68.38 x 1.620 =	110.78
Index		231.55

Base Conversion Table

To convert *ENR* Construction and Building Cost Indexes

From
1913 = 100 Base
To Divide 1913 = 100 Values By

	Const. Cost	Bldg. Index
1926 = 100	2.0803	1.8499
1929 = 100	2.0702	1.9086
1910–14 = 100	.9380	.9477
1924 = 100	2.1536	1.8578
1923–25 = 100	2.1204	1.8481
1914 = 100	.8856	.9191
1911 = 100	.9343	.9414

CONSTRUCTION Cost Index—1913 = 100

32	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	1943†	1944†
.48	158.44	191.26	198.22	201.23	221.20	239.62	234.72	238.34	249.69	267.63	283.45	294.57
1.82	159.30	194.06	195.07	201.33	222.05	238.99	234.31	238.32	250.50	269.41	283.48	295.05
.24	158.44	194.06	194.41	201.63	224.75	238.79	234.43	238.29	250.71	269.71	285.24	295.34
.12	160.16	195.86	194.65	202.80	231.35	237.95	234.86	238.26	252.40	271.78	288.80	297.70
2.78	164.39	199.61	193.96	204.05	233.45	236.80	234.69	238.86	255.55	272.30	289.87	....
2.20	163.41	199.61	196.73	205.08	237.25	236.86	235.02	241.59	256.79	274.19	289.94	....
.36	165.50	199.65	197.43	204.80	239.90	232.29	234.94	242.15	258.18	277.65	289.92	....
.80	167.00	198.40	197.45	208.48	240.65	232.39	234.90	242.18	260.41	281.61	291.38	....
.96	175.48	200.58	197.30	208.88	241.62	232.70	234.97	244.13	263.12	281.61	294.09	....
.16	187.74	200.86	197.50	211.53	241.90	234.30	236.86	245.02	264.46	282.44	294.31	....
.20	190.14	201.36	197.35	211.50	241.40	234.40	238.20	247.24	266.13	283.64	294.41	....
.46	192.41	201.86	197.20	215.70	241.05	234.89	238.17	249.12	266.16	283.69	294.51	....
.97	170.18	198.10	196.44	206.42	234.71	235.86	235.51	241.96	257.84	276.31	289.95	....

CONSTRUCTION Cost Index—1926 = 100

932	1933	1934	1935†	1936†	1937†	1938†	1939†	1940†	1941†	1942†	1943†	1944†
78.1	76.2	91.9	95.3	96.7	106.2	114.9	112.9	114.6	120.0	128.7	136.3	141.6
77.8	76.6	93.3	93.8	96.8	106.7	114.9	112.7	114.6	120.4	129.5	136.3	141.8
75.6	76.2	93.3	93.5	96.9	108.0	114.8	112.7	114.6	120.5	129.7	137.1	142.0
73.6	77.0	94.1	93.5	97.5	111.2	114.4	112.9	114.5	121.3	130.6	138.8	143.1
73.4	79.0	95.9	93.2	98.2	112.0	113.8	112.8	114.8	122.8	130.9	139.3	....
73.2	78.5	95.9	94.6	98.5	113.8	113.9	113.0	116.1	123.4	131.8	139.4	....
73.7	79.6	96.0	94.9	98.4	115.1	111.7	112.9	116.4	124.1	133.5	139.4	....
75.4	80.3	95.4	94.9	100.2	115.7	111.7	112.9	116.4	125.2	135.4	140.1	....
75.9	84.4	96.4	94.9	100.4	115.9	111.9	113.0	117.4	126.5	135.4	141.4	....
76.5	90.2	96.6	95.0	101.5	116.1	112.7	113.9	117.8	127.1	135.8	141.5	....
76.0	91.4	96.8	94.9	101.5	115.8	112.7	114.5	118.9	127.9	136.4	141.5	....
76.2	92.4	97.0	94.8	103.4	115.7	112.9	114.5	119.8	127.9	136.4	141.6	....
75.4	81.8	95.2	94.4	99.2	112.7	113.3	113.2	116.3	124.0	132.8	139.4	....

Based on 2 x 4 S4S fir and pine *ENR* 20-cities' average lumber component instead of x 12 yellow pine wholesale in New York used prior to 1935. For explanation see page of June 30, 1938 *ENR*.

Special Building Cost and Volume Indexes

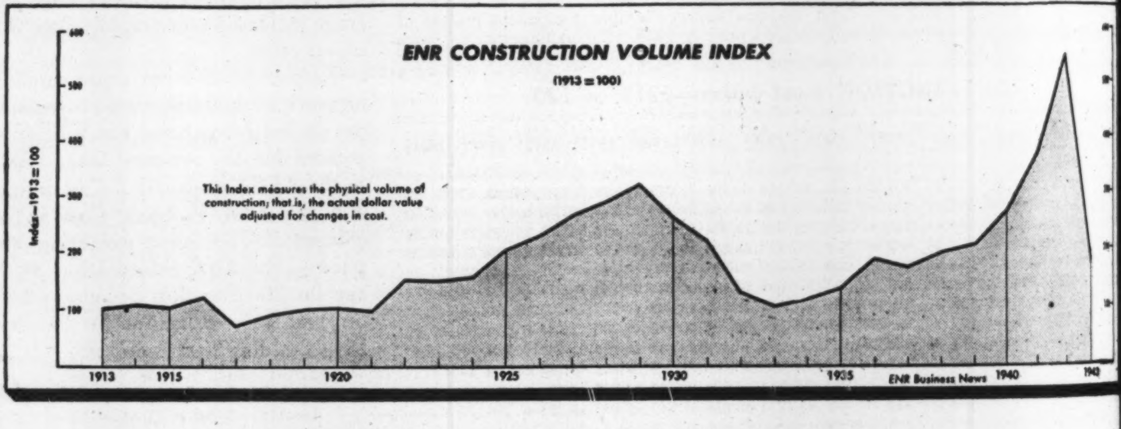
The American Appraisal Company Construction Cost Trend Index — 1913 = 100

For average of four types of buildings: All Frame, Brick-Wood Frame, Brick-Steel Frame and Reinforced Concrete.

These indices cover structural items only, and do not include factors for Plumbing, Heating, Lighting, Elevators, etc.

	1914	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41
U. S. AVER.	98	101	116	143	177	229	283	216	200	224	222	217	217	217	217	217	200	178	155	150	161	162	170	198	199	200	204	218
	24 Cities											30 Cities																
Boston	100	103	118	149	183	234	288	220	209	232	229	224	224	222	222	224	212	195	169	163	170	169	178	212	209	210	214	225
New York	99	100	115	142	175	227	299	245	219	245	241	230	234	234	235	237	219	201	170	167	176	174	182	213	216	219	223	233
Buffalo	98	99	115	144	180	232	278	214	197	228	225	218	219	217	213	212	195	178	157	150	160	158	165	202	206	205	207	221
Baltimore	97	99	116	150	193	239	289	215	206	233	229	226	224	226	227	228	211	186	166	158	167	173	180	200	200	198	200	220
Philadelphia	98	102	115	145	181	236	300	220	201	232	230	224	225	228	227	227	209	190	161	156	166	166	171	193	194	196	207	225
Pittsburgh	97	99	115	142	179	231	290	221	201	228	238	233	236	237	236	236	217	198	172	161	170	168	177	211	219	219	219	225
Cincinnati	99	100	115	143	173	217	276	211	194	221	221	219	217	219	219	220	202	176	157	151	161	162	174	206	209	209	213	223
Cleveland	97	99	120	149	179	233	303	227	210	241	243	236	233	231	232	232	216	188	160	151	164	168	175	208	207	206	209	224
Chicago	97	100	116	141	170	224	294	226	202	228	225	224	219	222	222	222	205	185	162	156	166	169	179	204	205	205	207	216
Indianapolis	102	104	119	146	175	221	279	221	202	225	227	222	219	222	224	224	206	182	157	150	161	161	169	199	204	205	209	233
Detroit	99	102	122	150	187	244	304	220	200	229	227	226	224	222	221	220	202	174	148	146	157	160	168	203	205	207	212	226
Milwaukee	100	103	120	150	178	237	290	212	195	224	224	217	218	219	220	218	197	163	144	141	156	163	178	208	208	209	213	225
Minneapolis	98	100	114	142	171	218	277	210	193	214	208	201	197	197	197	198	182	165	148	146	154	154	162	199	201	202	203	214
Kansas City	98	102	120	150	184	239	280	220	211	231	228	220	220	215	213	213	193	178	156	149	160	162	169	202	209	209	211	221
St. Louis	97	100	114	141	175	228	284	225	204	228	238	233	230	226	225	224	205	188	163	156	166	164	171	207	207	207	211	220
Atlanta	97	98	111	140	186	250	304	218	202	226	217	209	211	214	215	215	195	173	147	142	162	163	170	192	185	187	193	215
Dallas	100	105	121	145	176	227	274	209	191	209	206	198	204	204	202	202	187	168	146	139	149	148	154	170	168	171	173	187
New Orleans	97	96	113	136	174	239	282	217	201	225	227	216	217	218	215	215	198	170	145	141	159	159	166	186	187	194	202	214
Denver	100	102	118	145	171	216	262	206	191	202	206	204	204	202	205	207	189	168	149	141	150	151	157	190	193	195	199	209
Seattle	96	101	115	141	176	224	268	197	186	207	206	201	199	195	194	198	184	159	141	136	150	154	161	194	193	195	200	219
San Francisco	97	104	118	139	169	214	258	204	189	208	199	194	188	188	188	190	177	158	144	138	145	144	155	178	176	180	181	201
Los Angeles	97	102	112	133	162	213	251	208	199	213	204	197	195	193	193	196	178	157	141	134	142	140	143	165	166	167	166	183

NOTE — These construction cost index figures are based on 1913 as 100% for each individual location, thus indicating the trend in each city and not the trend between the various locations. The index figures are calculated on the basis of normal average material prices, average labor wages, and the market conditions in the individual cities and reflect extremes such as premium prices and overtime wages for rush work during periods or the "extreme low" of cut-throat practices during the "depression perio



Engineering News-Record Construction Volume Index — 1913 = 100

	1914	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32	'33	'34	'35	'36	'37	'38	'39	'40	'41	'42
Jan.	71	48	96	69	57	38	138	52	100	151	125	141	198	187	208	325	199	208	121	129	149	131	248	168	172	287	173	402	402
Feb.	83	76	95	47	151	91	130	55	68	129	144	145	187	182	225	378	204	198	105	82	156	75	177	181	189	187	196	374	507
Mar.	142	75	90	55	90	52	113	90	186	162	161	161	240	226	318	382	408	278	97	62	130	101	157	146	188	210	162	386	578
Apr.	113	82	137	65	58	78	134	109	161	186	159	211	233	257	316	332	320	289	135	65	109	130	165	160	176	221	191	322	509
May	155	96	129	50	67	80	126	108	221	149	191	209	254	290	299	395	354	251	149	103	101	107	148	214	167	232	201	275	821
June	128	105	129	57	106	129	92	119	178	173	149	214	246	207	308	347	324	243	131	109	119	120	193	246	166	193	225	492	752
July	139	129	136	87	107	122	83	115	146	151	161	178	248	252	266	320	226	248	166	65	128	95	187	187	207	166	308	635	736
Aug.	118	126	130	63	111	135	86	116	137	100	162	266	252	306	306	290	259	187	111	73	94	138	197	152	215	228	281	434	622
Sept.	95	116	145	166	145	113	80	109	149	166	159	262	227	273	296	340	232	225	124	122	101	125	201	150	213	190	324	419	544
Oct.	108	101	97	87	67	207	79	130	154	154	164	233	244	269	363	273	211	229	137	162	98	159	180	167	217	222	490	263	421
Nov.	84	150	105	76	66	71	57	106	114	121	128	194	211	272	251	245	207	180	137	133	115	169	163	148	199	219	331	282	462
Dec.	62	89	106	49	27	41	63	117	134	123	145	206	188	319	244	166	192	133	113	116	105	252	208	143	249	172	344	217	227
Aver.	107	100	119	67	86	98	99	96	147	146	154	201	228	263	287	317	260	220	127	102	114	134	185	172	197	211	269	375	553
1926 = 100.	47	44	52	39	38	43	43	42	64	64	68	88	100	115	126	139	114	96	56	45	50	50	81	75	86	92	118	164	243

New value reported in *Engineering News-Record* each month.

INNEAR ROLLING
OORS PROVIDE
LL the ANSWERS

Economy. Kinnear Rolling Doors
nto a small coil above the doorway.
ounding floor, wall and ceiling space
usable at all times. Objects placed
a few inches of the door — inside or
ill not hinder their opening or closing.

nience. Carefully counterbalanced for
d smoothness of operation, they clear
ning *from jamb to jamb — from floor*
. Snow, ice and other obstacles never
their operation.

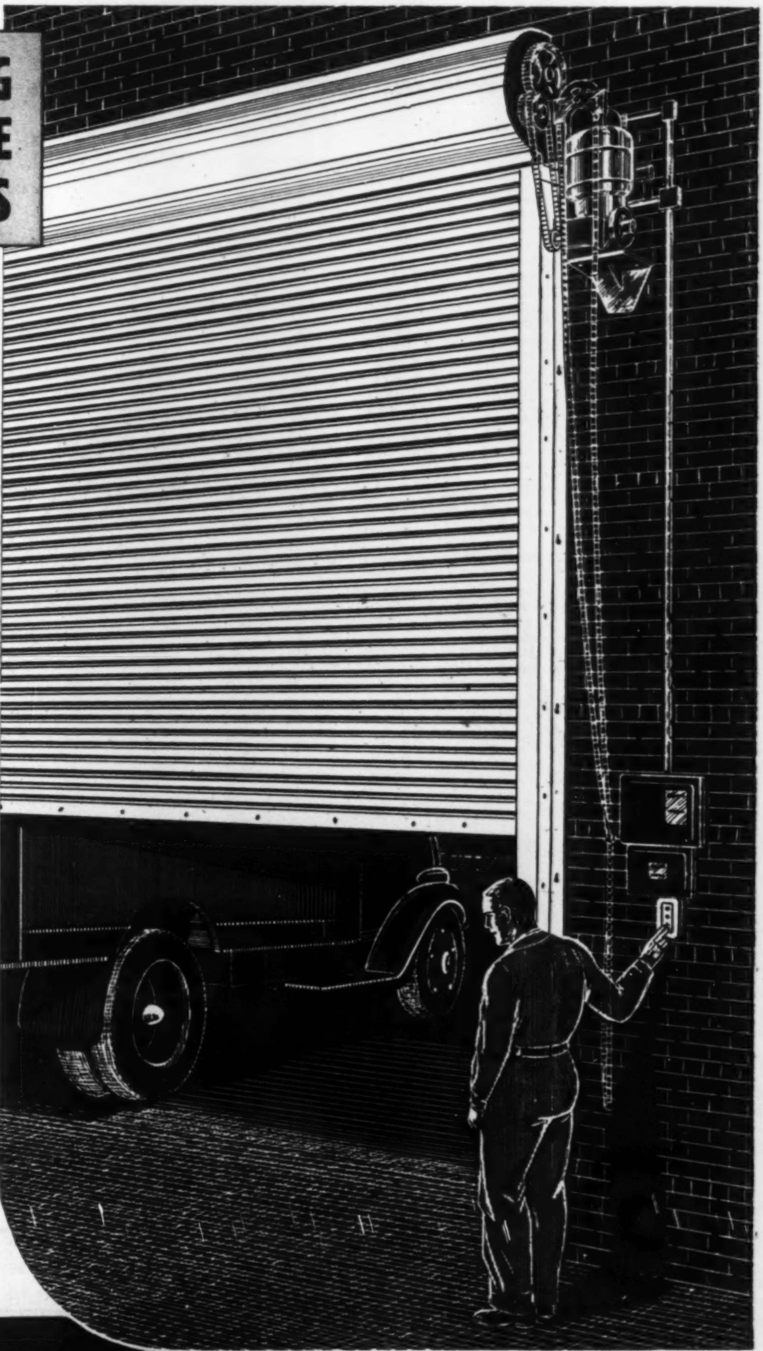
c Control. Kinnear Motor Operators
ximum convenience to the recognized
ges of Kinnear Rolling Doors. They
rmit the use of push-button control
at any number of remote locations.

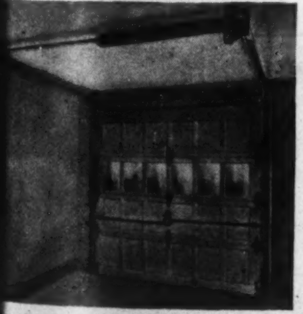
lity. Kinnear Rolling Doors not only
t of the way, safe from damage — not
ovide *all-steel resistance* to wear and
— but the steel-slat curtain also tends
under impact . . . to absorb blows that
therwise damage the doors.

aintenance. The low-cost operation
ear Rolling Doors is proved by nearly
century of satisfactory performance.
case of accidental damage, any re-
number of slats can be replaced
and economically.

tion. The rugged interlocking-slat
tion of the Kinnear Rolling Door pro-
"curtain of steel" — treated with a
rust-resistant coating—that resists fire,
n, sabotage, and the elements.

nstallation. Every Kinnear Door is
ly designed and assembled to meet
ual requirements. They are made to fit
ening, in old or new buildings. And
always sees to it that you get *correct*
es, *accurate* working drawings, com-
nstallation details. If you wish, Kin-
nationwide service organization will
trained erection crews to relieve you
work and responsibility of installation.





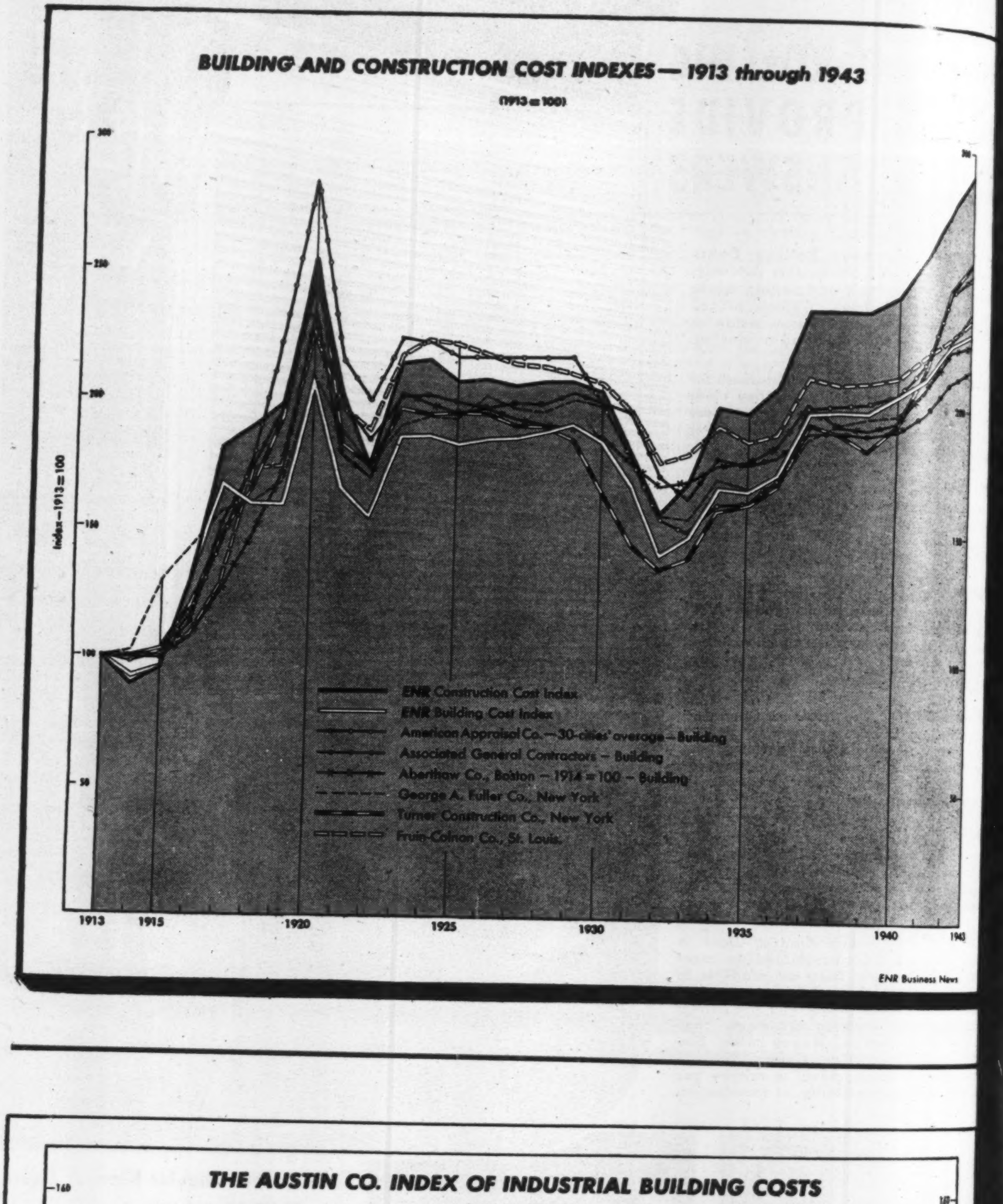
Two More Popular Kinnear Doors

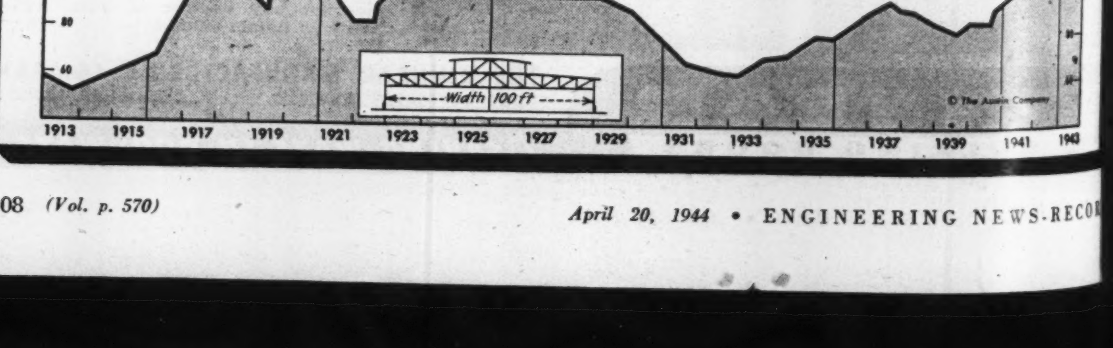
The KINNEAR RoL-TOP Door (far left) is an all purpose door consisting of several sections fitted with ball bearing rollers and operating in steel tracks. It features a special "keystone" sealing device. Motor or manual control. The KINNEAR BIFOLD is a heavy duty quick-acting door of two horizontal, hinged sections. Both types provide for any number of light sections. Write for further details.

KINNEAR
ROLLING DOORS

THE KINNEAR MANUFACTURING COMPANY
1820-40 Fields Ave. Columbus 16, Ohio

SAVING WAYS IN DOORWAYS


BUILDING AND CONSTRUCTION COST INDEXES — 1913 through 1943
(1913=100)
Index—1913=100
300
250
200
150
100
50
1913
1915
1920
1925
1930
1935
1940
1943
ENR Construction Cost Index
ENR Building Cost Index
American Appraisal Co.—30-cities' average—Building
Associated General Contractors – Building
Aberthaw Co., Boston — 1914 = 100 – Building
George A. Fuller Co., New York
Turner Construction Co., New York
Fruin-Colnon Co., St. Louis
ENR Business News


THE AUSTIN CO. INDEX OF INDUSTRIAL BUILDING COSTS
(1926=100)
160
140
120
100
80
60
Width 100 ft
© The Austin Company
1913
1915
1917
1919
1921
1923
1925
1927
1929
1931
1933
1935
1937
1939
1941
1943

Construction and Building Cost Indexes—1913 through 1943

Year Base = 100	AAC (Old) 1913	AAC (New) 1913	AGC 1913	ENR Bldg. 1913	ENR Const. 1913	Boeckh New York 1913	Handy R. C. Atl. Seab'd. 1911-'14	ICC-RR Sta. & Off. Bldg. 1910-'14	Aberthaw 1914	Austin Co. 1913	Fruin-Colnon 1913	Fuller 1913	Tilghman Moyer 1913	Turner 1913
1913	100	100	100	100	100	100	...	...	...	100	100	100	100	100
1914	98	98	99	92	89	102	...	...	100	105	100	102	92	100
1915	101	101	100	95	93	99	...	101	100	115	102	130	96	103
1916	116	116	114	131	130	116	153	115	107	141	108	143	115	120
1917	144	143	152	167	181	135	233	135	126	172	128	156	142	147
1918	172	177	175	159	189	155	242	154	147	206	173	160	148	166
1919	213	229	198	159	198	171	237	185	172	198	174	168	190	196
1920	270	283	247	207	251	230	260	215	234	241	227	209	258	252
1921	205	216	200	166	202	193	207	192	179	180	197	188	210	183
1922	189	200	184	155	174	187	165	180	170	157	188	175	177	175
1923	212	224	201	186	214	215	199	194	202	181	217	190	214	196
1924	210	222	202	186	215	215	226	193	198	181	223	194	212	194
1925	203	217	199	183	207	211	219	188	195	185	222	193	209	195
1926	206	217	197	185	208	230	213	184	197	185	218	202	207	195
1927	206	217	200	186	206	223	208	189	193	178	214	197	202	190
1928	205	217	199	188	207	238	205	188	191	172	213	196	204	190
1929	206	217	203	191	207	242	211	187	190	170	211	201	208	185
1930	199	200	200	185	203	238	200	182	186	155	207	199	196	165
1931	171	178	196	169	181	230	184	165	176	131	196	180	170	145
1932	152	155	171	141	157	208	165	141	168	117	178	157	150	136
1933	146	150	163	148	170	197	159	145	170	117	181	155	152	140
1934	157	161	178	167	198	209	186	151	176	128	191	171	163	160
1935	157	162	176	166	196	200	190	151	177	139	185	167	178	162
1936	163	170	179	172	206	205	192	157	184	150	188	168	188	169
1937	181	198	188	196	235	226	208	166	199	165	210	187	214	192
1938	182	199	189	197	236	243	210	166	191	161	207	192	221	188
1939	183	200	188	197	236	248	206	166	190	152	208	195	229	182
1940	...	204	189	203	242	251	210	177	193	163	211	196	231½	193
1941	...	217	198	211	258	255	228	188	207½	198	220	206	...	215
1942	...	241	209	222	276	260	252	208	223	213	227	229	...	245
1943	...	252	216	229	290	264	254	...	225	215	235	238	...	257

Descriptions of Leading Building and Construction Cost Indexes

AMERICAN APPRAISAL COMPANY (AAC)—Average for 30 cities of four types of buildings: wood frame, brick-wood frame, brick-steel frame, reinforced concrete. Mechanicals not included. Based on actual appraisal costs. Available for individual cities (see page 106). Recently revised to include adjustments for social security taxes, unemployment insurance and corresponding "overhead". Base: 1913=100.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA (AGC)—Wages and materials for 12 cities combined in 40-60 ratio. Wages, prevailing rates for hod carriers and common labor. Materials, weighted: sand, gravel and crushed stone, 1; cement, 1; lumber, 1; hollow tile, ½; structural and reinforcing steel, ½. Base: 1913=100.

ENGINEERING NEWS-RECORD BUILDING COST (ENR Bldg.)—For complete description see pages 104 and 105.

ENGINEERING NEWS-RECORD CONSTRUCTION COST (ENR Const.)—For complete description see pages 104 and 105.

E. H. BOECKH & ASSOC., INC.—Individual series for ten types of buildings for sixteen areas. (See page 116). Weights based on studies of actual building costs—vary with different type of structures. Labor efficiency correction used. Material prices from local building trade papers. Prevailing skilled and common wage rates from contractors. Base: United States average, 1926-29=100. Series given here is brick and concrete, New York, converted to 1913=100 base.

HANDY PUBLIC UTILITY CONSTRUCTION COST—Compiled and published Jan. 1 and July 1 of each year by Whitman, Requardt & Smith. (See page 112.) Individual series for 81 cost elements in three classes of utility construction, for five geographic divisions of United States.

Weighting based on wide experience in cost analysis of plant and construction. Material prices from Engineering News-Record and Iron Age. Labor cost trends from U. S. Dept. of Labor and National Association of Builders Exchanges. Base 1911-14=100. The reinforced concrete building construction series is tabulated in this table.

RAILROAD CONSTRUCTION INDEX (ICC-RR)—Compiled by Engineering Section, Bureau of Valuation, Interstate Commerce Commission. (See page 110). Indexes for road (47 subseries), equipment (8 subseries), and general expenditures (7 subseries), for national average and 8 regional areas. Series quoted here is road, subseries 16, station and office buildings, national average. Computed from analysis of contracts covering major construction projects over 30-year period, and other information furnished by carriers. Base: 1910-14=100.

ABERTHAW—New England, seven-story and basement (62'4"x202'4"), reinforced concrete building built in 1914, repriced quarterly as a construction bid to duplicate original building. Labor costs based on current experience with similar construction. Base: 1914=100.

AUSTIN INDUSTRIAL BUILDING COST—Repricing typical one-story, steel frame, monitor type industrial building at regular intervals. Structure has concrete foundations, curtain walls of brick and large areas of steel sash and glass; concrete floor laid on ground; 2-in. lumber roof deck on heavy timber covered with 4-ply waterproofing. Monitor sash equipped with mechanical operators. Pricing at representative points in central and eastern states. Base: 1926=100. (See page 108.) Table series converted to 1913=100.

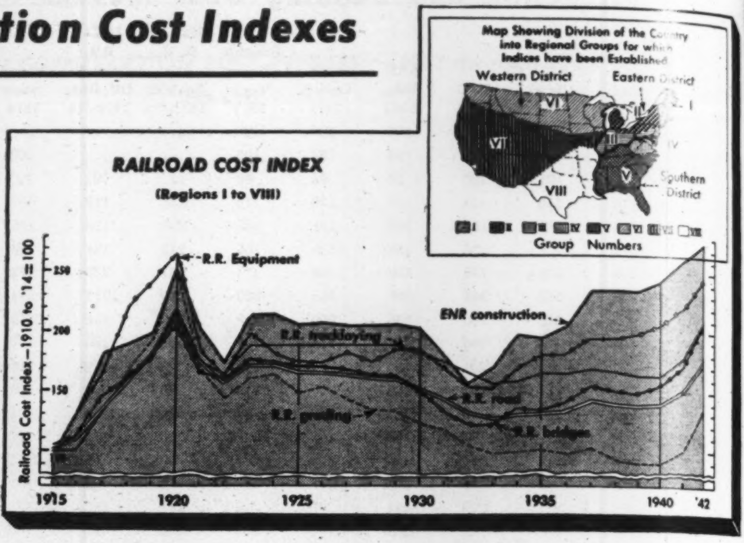
FRUIN-COLNON—Industrial plant of five buildings in St. Louis repriced on basis of contractor's actual and estimated material and labor costs. Base: 1913=100.

GEORGE A. FULLER COMPANY—Composite of 36 major cost elements, in three commercial type buildings, including mechanicals, elevators, wiring, heating and ventilating, repriced. Base 1913=100.

TILGHMAN MOYER COMPANY—Compiled monthly from actual cost records in construction of bank buildings in eastern United States. Includes all typical building items, and, in addition, all fixtures which are special in bank work, which in many cases exceed structural costs. Index reflects saving occasioned by use of reconditioned equipment from closed banks. Base: 1913=100. Not computed in 1941, 1942 or 1943.

TURNER CONSTRUCTION COMPANY—Eastern cities. Own building cost experience applied to these factors: labor rates, material prices, productivity of labor, efficiency of plant and management, competitive conditions. Base: 1913=100.

Railroad Construction Cost Indexes



THESE INDEXES by Engineering Section, Bureau of Valuation, Interstate Commerce Commission, include items developed from analysis of major construction contracts over a period of 30 years. Indexes for material accounts are based on studies of carriers' returns to Valuation Order 14, joint studies made with various sub-committees of Presidents' Conference Committee, well-known engineering and trade publications, contracts covering major construction projects over a period of 30 years, and other information furnished by individual carriers.

Railroad Cost Indexes for Regions by Years for "Road" Construction — 1910-14 = 100

Total of Accounts 1-46, ROAD, Engineering Section, Bureau of Valuation, Interstate Commerce Commission, August 1, 1943

United States	Per Cent	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Reg. I to VIII	**73.09**	**178**	**214**	**175**	**157**	**171**	**171**	**166**	**166**	**164**	**161**	**160**	**152**	**143**	**131**	**127**	**131**	**131**	**133**	**142**	**138**	**137**	**140**	**151**	**175**
Reg. I	75.36	184	220	178	163	177	178	172	173	171	167	166	158	148	134	131	133	134	136	146	141	140	144	156	180
Reg. II	68.15	180	214	176	160	174	174	168	168	167	165.	164	157	145	133	130	134	134	136	146	142	141	145	156	178
Reg. III	67.99	180	214	176	160	173	173	169	168	167	164	163	155	143	132	129	133	133	136	146	142	144	146	157	179
Reg. IV	70.49	180	214	173	152	167	166	164	163	159	155	154	145	133	126	122	125	126	127	137	132	131	135	146	172
Reg. V	76.66	179	218	171	153	168	167	163	164	160	156	156	148	137	129	125	129	128	131	141	137	136	139	149	175
Reg. VI	77.41	177	215	175	155	169	170	163	164	162	158	158	150	138	129	125	128	128	129	139	134	132	135	145	171
Reg. VII	75.62	175	212	177	158	170	170	165	166	163	160	158	151	139	131	128	130	129	131	140	135	133	135	145	162
Reg. VIII	78.15	176	208	173	157	171	171	166	167	164	161	161	154	143	133	130	133	134	135	144	141	140	142	153	175

(Indexes represent territorial index factors and are not necessarily applicable for determining unit reproduction costs upon individual roads.)

Railroad Cost Index by Accounts Applicable to Entire U. S., Regions I to VIII, Inclusive

"Road" Construction	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942
Engineering	178	214	175	157	171	171	166	166	164	161	160	152	143	131	127	131	131	133	142	138	137	140	151	175
Grading	190	250	170	143	160	164	149	153	143	135	133	123	118	106	98	100	101	99	103	93	90	90	99	135
Underground Power Tubes	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tunnels and Subways	183	208	179	165	179	179	179	178	169	155	155	143	130	119	111	122	120	130	139	141	140	149	160	192
Bridges, Culverts, etc	178	206	165	160	176	173	171	170	168	164	163	150	134	122	122	136	135	141	155	150	149	156	174	210
Elevated Structures	184	210	150	153	173	171	168	165	163	163	162	154	144	129	122	136	136	137	158	150	149	159	175	209
Ties	170	201	189	157	177	175	172	173	175	176	175	170	155	144	139	149	147	150	159	154	158	164	181	199
Rails	152	168	158	144	145	145	144	144	144	144	144	144	144	140	134	123	123	124	143	139	136	138	139	144
Other Track Material	203	209	192	161	182	179	177	177	177	177	170	169	165	163	158	150	147	150	169	169	167	167	170	175
Ballast	150	207	191	176	175	175	174	175	176	176	176	168	159	146	146	141	139	140	143	143	143	143	153	170
Track Laying and Surfacing	175	218	174	165	188	188	188	188	188	188	188	182	175	164	157	159	165	165	169	167	165	165	178	209
Right-of-way Fences	194	204	189	177	179	179	176	175	175	175	173	171	164	147	135	140	140	138	143	144	139	139	147	165
Snow, Sand Fences, Sheds	199	280	197	194	212	200	201	201	204	204	204	198	188	125	126	140	140	140	155	155	155	155	164	174
Crossings and Signs	182	208	171	164	178	175	171	169	166	165	165	161	153	131	127	139	137	139	152	145	142	146	163	198
Station and Office Bldgs	185	215	192	180	194	193	188	184	189	188	187	182	165	141	145	151	151	157	166	166	166	177	188	208
Roadway Buildings	185	216	192	178	196	196	189	187	192	191	190	186	166	140	145	150	150	150	162	162	162	177	186	206
Water Stations	191	213	185	178	187	187	186	182	185	186	184	177	161	147	151	155	155	156	166	166	166	172	185	196
Fuel Stations	190	212	181	166	185	185	182	180	183	183	183	174	159	144	149	154	154	153	159	159	159	163	187	205
Shops and Engine Houses	188	216	191	180	193	192	188	185	189	188	187	176	161	137	142	147	147	155	165	165	165	176	188	204
Grain Elevators	185	214	190	184	197	197	193	190	195	193	193	182	165	137	142	147	147	156	164	164	164	166	200	208
Storage Warehouses	185	210	193	178	198	198	193	189	193	191	191	184	165	137	142	147	147	154	166	166	166	176	195	207
Wharves and Docks	178	204	167	158	175	175	174	177	178	178	178	172	158	136	141	146	146	149	153	153	153	161	167	212
Coal and Ore Wharves	184	204	170	159	176	176	174	174	176	176	176	172	157	136	142	147	147	151	153	153	153	160	185	199
Gas Producing Plants	194	213	194	176	188	189	186	185	188	189	189	178	163	145	148	176	176	178	178	177	179	188	198	200
Telegraph and Telephone Lines	164	192	191	162	187	179	163	157	163	165	165	150	138	121	119	124	128	131	135	129	129	134	143	156
Signals and Interlockers	165	175	163	158	165	164	162	169	158	155	154	147	138	130	130	133	136	138	143	143	143	146	156	165
Power Dams, Canals, Pipe Lines	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	151	149	149	149	150	181	185
Power Plant Buildings	189	218	197	184	196	196	191	186	191	191	189	177	162	138	143	148	148	152	167	167	167	176	194	204
Power Substation Buildings	187	218	194	180	197	197	192	188	193	191	190	176	161	137	142	147	147	138	164	164	164	175	187	203
Power Transmission System	186	176	145	132	142	136	140	141	137	142	150	136	116	98	98	103	105	108	123	110	110	114	119	121
Power Distribution System	189	205	172	163	178	172	175	176	175	178	181	173	148	144	144	148	151	152	155	149	149	155	163	165
Power Line Poles, Fixtures	194	230	208	179	209	203	185	183	198	199	209	200	172	147	147	150	153	148	157	152	152	152	173	196
Underground Conduits	206	250	228	214	220	215	220	216	219	219	217	215	175	175	175	180	184	185	185	185	185	185	190	209
Miscellaneous Structures	186	217	192	179	195	195	190	186	191	190	189	182	164	141	146	151	151	154	161	161	161	168	178	183
Paving	205	217	191	190	191	191	191	190	190	190	190	190	181	156	150	145	145	145	150	150	150	150	171	190
Roadway Machines	158	170	162	149	151	151	151	151	151	149	148	147	144	138	138	147	147	147	161	153	154	158	169	180
Roadway Small Tools	184	202	181	170	173	185	190	190	191	191	190	160	155	155	150	150	150	160	176	180	180	180	190	209
Shop Machinery	200	210	198	173	183	185	185	186	187	189	191	176	166	155	155	179	179	179	198	200	202	212	224	224
Power Plant Machinery	200	210	198	173	183	185	185	186	187	189	191	176	166	155	155	179	179	193	206	199	205	215	223	223
Power Substation Apparatus	200	210	198	173	183	185	185	186	187	189	191	176	166	155	155	155	150	145	149	151	150	158	160	160

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Serving Industry over 50 Years

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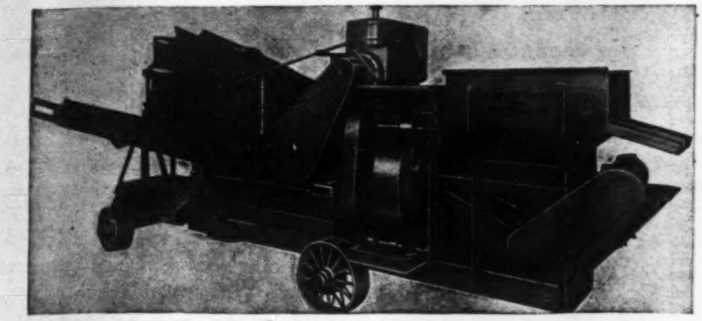
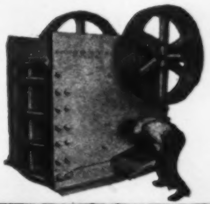
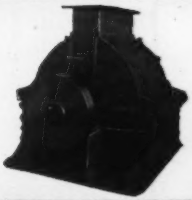


PORTABLE STRAIGHT LINE CRUSHING & SCREENING PLANT



JAW CRUSHERS
Roller Bearing—25x42

TWO-in-ONE HAMMER MILLS
For Agregate or Dust



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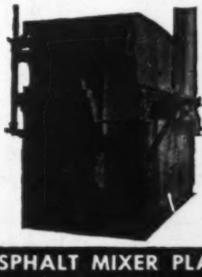
Secondary Limestone Pulverizing

Yes, our Government has taken a large portion of our capacity for War Work. Many of the units designed and perfected for wartime service will be continued, to serve our country's Quarry and Gravel Operators in peace times. The units on review here of sturdy, long life construction are proud examples of Gruendler's Engineering, backed by 59 years of experience.

Over 1150 Various Types of Units, since Pearl Harbor, are now serving the United Nations.



ASPHALT MIXER PLANT
(portable)

PORTABLE CRUSHERS
Windrow Type

GRUENDLER ST. LOUIS

GRUENDLER

CRUSHER *and* PULVERIZER CO.

2915-17 North Market St., ST. LOUIS (6), MO.

Public Utility Construction Cost Index

Compiled and published by Whitman, Requardt and Smith, Consulting Engineers, Baltimore, Md., for the Estate of William W. Handy

Table No. 1 Cost Trends of Building Construction, 1911 to 1914 = 100

(Complete Index reports 13 items entering into Building Construction Costs.) A relates to Reinforced Concrete Bldg.; B relates to Brick Bldg.

Cl. of Constr. Mat'l, and Labor	July 1 1920	Nov. 1 1920	Jan. 1 1921	Sept. 1 1921	Feb. 1 1922	Jan. 1 1923	Jan. 1 1924	July 1 1924	Jan. 1 1925	July 1 1925	Jan. 1 1926	July 1 1926	Jan. 1 1927	July 1 1927	Jan. 1 1928	July 1 1928	Jan. 1 1929	July 1 1929	Jan. 1 1930	July 1 1930	Jan. 1 1931	July 1 1931	Jan. 1 1932	July 1 1932	Jan. 1 1933	July 1 1933	Jan. 1 1934	July 1 1934	Jan. 1 1935	July 1 1935	Jan. 1 1936	July 1 1936	Jan. 1 1937	July 1 1937	Jan. 1 1938	July 1 1938	Jan. 1 1939	July 1 1939	Jan. 1 1940	July 1 1940	Jan. 1 1941	July 1 1941	Jan. 1 1942	July 1 1942	Jan. 1 1943	July 1 1943	Jan. 1 1944
Atlantic Seaboard Division																																															
A	274	269	233	182	165	199	227	224	221	213	213	213	214	203	204	206	209	212	205	194	189	179	171	159	153	165	178	194	191	189	191	192	199	216	214	205	205	207	210	209	220	235	250	253	254	254	256
B	279	278	245	207	188	215	237	232	230	229	228	229	230	223	224	217	219	220	212	207	203	194	189	173	166	175	189	200	195	194	197	197	203	218	217	211	211	214	217	216	224	235	246	250	251	252	254
North Central Division																																															
A	270	263	228	181	163	193	219	214	212	208	203	201	205	194	195	197	200	203	199	190	185	177	169	154	151	162	175	186	182	182	186	187	196	209	209	200	200	200	202	201	210	225	237	242	243	243	246
B	272	269	238	201	181	206	225	218	216	215	212	211	214	208	209	201	203	205	199	195	192	186	181	164	161	170	183	190	185	184	188	189	197	207	208	203	203	203	205	204	210	220	229	234	235	235	240
South Central Division																																															
A	268	263	229	181	160	191	213	206	203	196	192	191	194	186	186	188	191	193	187	179	176	159	149	144	140	148	160	173	179	173	175	177	187	200	198	188	188	187	189	190	199	216	232	236	237	235	237
B	271	270	240	224	181	206	221	211	208	205	203	204	205	201	202	195	197	198	190	185	183	168	160	154	151	157	171	179	182	175	178	180	186	198	197	191	191	191	193	194	200	212	223	227	230	229	230
Plateau Division																																															
A	260	256	221	181	164	192	215	208	208	201	198	197	199	188	189	191	194	196	190	180	177	166	153	149	146	156	168	178	174	172	176	180	188	206	203	194	194	194	197	196	205	218	230	235	235	233	237
B	264	264	232	203	185	207	223	214	214	211	211	210	211	205	205	199	200	201	193	187	184	175	167	163	160	168	182	187	182	181	182	185	191	206	204	199	199	200	201	201	206	214	221	227	229	227	229
Pacific Division																																															
A	266	259	226	187	165	191	212	205	203	196	191	190	196	185	185	188	191	194	188	178	175	165	157	148	145	153	166	177	174	173	175	178	186	200	199	192	192	192	194	192	201	217	238	241	243	242	243
B	268	265	234	207	185	204	217	206	205	201	198	197	203	197	197	190	192	194	186	180	177	169	164	156	154	156	170	177	172	173	176	179	185	198	197	193	193	193	195	194	199	210	226	231	234	234	236

Table No. 2 Cost Trends of Gas Plant Construction, 1911 = 100

(Complete Index reports 17 items entering into Gas Plant Construction Costs) A relates to Total Constr. & Equip.; B relates to Mech. Equip. Exclusive of Gas Holders

	Jan. 1 1919	Jan. 1 1920	July 1 1920	Jan. 1 1921	Sept. 1 1921	Jan. 1 1923	Jan. 1 1924	July 1 1924	Jan. 1 1925	July 1 1925	Jan. 1 1926	July 1 1926	Jan. 1 1927	July 1 1927	Jan. 1 1928	July 1 1928	Jan. 1 1929	July 1 1929	Jan. 1 1930	July 1 1930	Jan. 1 1931	July 1 1931	Jan. 1 1932	July 1 1932	Jan. 1 1933	July 1 1933	Jan. 1 1934	July 1 1934	Jan. 1 1935	July 1 1935	Jan. 1 1936	July 1 1936	Jan. 1 1937	July 1 1937	Jan. 1 1938	July 1 1938	Jan. 1 1939	July 1 1939	Jan. 1 1940	July 1 1940	Jan. 1 1941	July 1 1941	Jan. 1 1942	July 1 1942	Jan. 1 1943	July 1 1943	Jan. 1 1944
Atlantic Seaboard Division																																															
A	239	253	279	265	205	224	241	238	234	229	230	230	226	223	215	216	216	219	218	216	214	208	202	188	176	178	189	216	216	217	218	218	225	246	246	244	241	249	253	253	257	264	272	275	276	279	279
B	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298
North Central Division																																															
A	210	221	257	248	201	206	226	224	220	217	217	218	214	211	204	205	204	206	207	208	207	203	198	178	182	185	196	203	202	203	208	208	219	235	237	235	232	232	236	236	238	245	249	254	258	261	262
B	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298
South Central Division																																															
A	214	223	251	246	203	196	214	210	205	199	199	200	198	195	187	187	187	190	188	187	185	177	171	160	158	167	177	184	195	196	202	202	208	223	222	219	216	217	220	220	223	236	244	249	254	255	255
B	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298
Plateau Division																																															
A	207	214	234	231	194	193	210	206	206	201	202	202	198	195	187	189	189	191	189	188	186	181	176	166	170	173	184	191	190	190	195	195	202	221	221	220	216	217	220	220	223	228	232	237	238	238	239
B	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298
Pacific Division																																															
A	209	228	255	248	212	203	219	215	211	206	205	206	206	203	196	197	197	201	200	198	197	191	187	177	180	178	189	196	195	197	198	203	210	228	228	230	227	228	232	231	235	244	253	257	258	261	262
B	219	222	241	248	201	194	220	218	217	213	212	212	216	211	208	209	213	221	224	222	219	217	209	195	192	199	216	230	232	234	240	240	252	277	277	274	274	278	282	282	282	295	297	299	299	298	298

Table No. 3 Cost Trends of Electric Light and Power Construction, 1911 = 100

(Complete Index reports 50 items entering into Electric Light and Power Construction Costs) A relates to Total Constr. & Equip.; B to Electr. Plant — Steam; C to Sub-Sta. Equip.

Cl. of Constr. Mat'l, and Labor	Jan. 1 1920	July 1 1920	Jan. 1 1921	Sept. 1 1921	Jan. 1 1923	Jan. 1 1924	July 1 1924	Jan. 1 1925	July 1 1925	Jan. 1 1926	July 1 1926	Jan. 1 1927	July 1 1927	Jan. 1 1928	July 1 1928	Jan. 1 1929	July 1 1929	Jan. 1 1930	July 1 1930	Jan. 1 1931	July 1 1931	Jan. 1 1932	July 1 1932	Jan. 1 1933	July 1 1933	Jan. 1 1934	July 1 1934	Jan. 1 1935	July 1 1935	Jan. 1 1936	July 1 1936	Jan. 1 1937	July 1 1937	Jan. 1 1938	July 1 1938	Jan. 1 1939	July 1 1939	Jan. 1 1940	July 1 1940	Jan. 1 1941	July 1 1941	Jan. 1 1942	July 1 1942	Jan. 1 1943	July 1 1943	Jan. 1 1944
Atlantic Seaboard Division																																														
A	208	226	221	183	189	201	196	201	197	197	194	193	187	192	192	195	206	204	188	191	188	182	176	170	177	186	200	200	199	204	205	213	230	226	222	224	225	232	231	233	242	248	248	250	252	251
B	196	206	216	194	186	195	192	199	196	197	196	194	190	193	192	200	208	206	198	198	195	192	186	182	186	200	205	205	204	205	209	210	229	226	223	225	224	235	234	234	236	241	239	242	242	241
C	175	197	201	182	176	187	186	191	190	184	178	176	172	173	173	170	181	179	174	177	175	172	168	165	166	172	184	184	184	185	187	188	204	204	203	203	203	212	212	212	213	217	216	216	216	216
North Central Division																																														
A	189	214	210	176	179	193	189	194	192	190	187	187	182	186	186	189	199	199	184	188	187	186	174	172	179	187	195	195	194	199	199	209	224	222	216	219	218	222	221	222	232	235	238	238	239	239
B	172	188	197	179	171	185	185	189	189	189	188	188	185	188	187	195	202	203	195	197	199	199	186	186	189	203	204	203	202	204	205	209	227	225	222	224	223	225	224	224	229	229	231	231	231	230
C	151	180	184	167	162	178	179	182	184	178	171	171	168	169	169	167	177	176	172	177	179	181	169	169	171	176	184	184	184	184	184	187	204	203	202	203	202	203	203	203	206	207	209	207	207	207
South Central Division																																														
A	193	218	216	183	182	193	186	189	186	184	183	182	179	183	186	189	199	197	185	186	183	179	171	169	179	187	195	198	193	199	201	208	224	221	216	218	218	223	224	227	239	245	246	247	247	248
B	178	197	210	188	181	190	186	189	186	187	189	187	186	189	195	202	210	209	205	204	203	200	190	189	198	211	212	212	203	208	212	214	234	232	229	231	230	235	237	240	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C	157	189	195	176	172	182	181	181	181	175	171	170	169	170	176	174	184	182	182	184	183	181	173	173	179	185	192	192	184	188	191	192	211	210	209	210	209	213	216	219	223	226	226	224	224	226
Plateau Division																																														
A	189	211	209	178	179	192	186	191	191	190	188	186	181	185	185	188	198	197	181	183	181	177	171	169	179	188	196	196	195	198	198	206	225	221	216	218	219	223	222	223	232	234	236	236	236	235
B	175	192	202	186	178	191	189	191	194	197	196	194	190	193	193	200	208	207	199	198	197	194	188	188	197	211	212	211	210	210	210	212	234	232	229	231	232	235	234	234	236	237	236	235	235	234
C	154	184	187	173	168	184	183	184	188	185	177	176	172	173	173	171	182	179	175	177	177	175	171	171	177	183	191	191	191	189	189	189	210	209	208	209	211	212	212	212	212	213	212	210	210	210
Pacific Division																																														
A	194	214	214	185	178	187	182	185	182	180	178	181	178	180	179	182	192	191	176	178	175	172	163	161	170	178	189	189	192	196	197	204	221	215	214	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
B	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

ANY STRUCTURE ASSEMBLED WITH RDELET *RIVET-BOLTS* WILL ALLOW EATER SALVAGE OF MATERIAL...

ollowing every war in which this country has en-ed, large quantities of material, new and used, ome marketable and are sold, proceeds to revert irectly to the taxpayer through the United States asury. Naturally, huge losses will be involved from ny factors which enter into the re-sale of material, ipment and buildings. Public demand that such es be held as low as possible will be quite natural, salvaging materials for re-use in civilian enter-es will be an imperative objective on the part of concerned.

this reason we point out that the recoverable sal-e from steel structures assembled with Dardelet *t-Bolts* quite naturally will be higher than that ined from such work that is hot-riveted. If hot-ted, such assemblies must be cut apart with chisels, urned apart with a torch. If assembled with *Rivet-s*, such structures will merely require backing off nuts with a wrench, and driving out the *Rivet-Bolt*, no damage to the structural steel members.

delet *Rivet-Bolts* have gained much recognition ing this war and have proved an adequate substi- for the time-honored method of hot riveting. ead of merely a substitute, Dardelet *Rivet-Bolts* e "discovered" to be more efficient than a hot-ted assembly. And so on airports, docks, bridges varied buildings, Dardelet *Rivet-Bolts* are used to t advantage, for *twice as many Rivet-Bolts* can be lied in the same time required for hot riveting *by same number of men.*

delet *Rivet-Bolts* with the famous Dardelet *Thread-e* are applied by "a man, and a maul and a wrench". rivet heating forge, no air compressor, no air ham-, no "bucker-up" are needed. *Rivet-Bolts* are ap-d cold, their deeply splined shanks forming a y-bound fit when driven into the drilled or punched e. When the Dardelet nut is applied, the powerful delet *Thread-Lock* comes into use and forms a d, permanent joint that can be loosened only by ing off the nut with a wrench. Ask for samples your own tests.

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Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood	Commercial & Factory Bldgs. Brick and Steel	Commercial & Factory Bldgs. Brick and Conc.
ATLANTA AREA										
1926–29	82.7	87.0	84.2	83.7	87.0	82.9	94.5	84.7	87.5	86.8
1913	41.2	43.7	42.4	43.3	45.6	40.6	45.2	43.0	44.3	43.0
1919	103.6	105.1	100.6	87.0	95.0	105.5	95.3	96.1	90.9	86.5
1920	137.1	139.6	133.1	110.6	119.6	140.6	111.8	129.6	108.5	111.0
1921	85.1	88.1	83.9	81.9	84.0	84.5	75.6	82.2	76.8	84.0
1922	83.4	85.8	81.8	79.6	82.2	83.6	73.1	79.5	74.6	80.6
1923	88.6	92.8	89.1	88.9	91.5	88.3	86.7	88.0	86.1	91.9
1924	85.0	89.8	89.2	91.1	91.9	88.8	88.8	88.3	89.8	94.7
1925	81.7	86.5	85.6	88.6	88.6	85.3	89.4	85.1	83.4	92.5
1926	83.1	87.1	83.7	85.1	86.4	82.1	93.4	84.5	86.6	85.1
1927	82.4	85.9	83.6	83.2	84.6	81.8	96.5	84.2	85.5	85.6
1928	85.6	89.4	86.7	86.0	87.9	84.8	93.3	85.7	88.5	86.6
1929	79.7	85.6	82.8	80.5	88.2	82.9	94.8	84.4	89.4	89.9
1930	80.9	85.3	82.8	84.5	85.7	78.2	91.8	83.6	83.6	86.1
1931	78.6	82.8	80.2	80.4	80.4	77.2	82.2	81.6	80.4	82.1
1932	71.0	75.2	73.6	77.2	77.0	68.7	80.8	77.4	78.1	78.3
1933	64.6	69.6	68.3	77.9	76.1	62.7	79.5	71.8	79.0	82.0
1934	70.6	76.6	74.6	83.8	83.4	68.9	91.5	78.5	86.4	87.4
1935	68.4	72.4	73.2	83.9	82.6	64.9	89.7	77.7	85.6	87.6
1936	68.4	72.4	73.2	84.4	83.3	65.8	89.7	77.8	85.8	87.1
1937	79.0	85.1	82.8	92.7	92.2	76.7	97.9	85.7	93.7	95.2
1938	81.6	85.0	85.2	95.9	96.2	79.5	100.5	87.4	96.9	98.1
1939	82.8	86.0	86.1	95.1	95.0	80.6	96.2	88.6	94.6	97.4
1940	88.1	90.3	90.6	96.8	97.3	86.3	100.1	91.5	97.3	98.4
1941	96.2	97.5	97.9	99.6	100.7	95.2	103.0	96.9	100.7	101.2
1942	102.5	102.8	102.8	104.4	105.1	101.1	106.3	101.4	105.1	104.9
1943	109.8	109.2	109.3	108.5	110.0	110.0	109.0	107.2	108.7	108.1
BALTIMORE AREA										
1926–29	107.2	112.0	107.6	100.6	100.7	106.3	95.5	106.8	96.8	101.2
1939	93.5	95.5	95.6	99.3	99.2	94.0	101.7	96.6	101.4	100.2
1940	100.1	101.3	102.0	102.5	103.0	101.0	105.3	102.7	106.1	103.3
1941	109.2	109.9	110.4	107.4	108.1	111.2	108.3	109.7	110.8	108.2
1942	115.1	115.0	115.1	113.6	113.9	115.9	112.2	114.4	116.6	114.2
1943	120.8	121.3	121.7	118.9	118.8	122.6	115.6	120.6	120.8	119.4
BOSTON AREA										
1926–29	116.3	120.3	115.4	106.2	107.0	118.8	106.3	112.5	108.7	105.8
1939	106.2	110.4	110.1	116.3	113.7	105.7	114.2	111.5	118.2	118.5
1940	111.7	114.7	114.3	116.9	114.9	112.3	114.6	114.6	119.1	119.2
1941	121.3	122.4	122.2	118.1	117.6	123.4	115.9	119.3	121.1	120.2
1942	128.4	129.4	129.0	124.3	123.6	131.5	120.1	123.7	126.3	126.3
1943	135.2	135.7	135.2	130.0	129.0	139.0	124.3	130.7	132.0	132.5
CHICAGO AREA										
1926–29	109.2	114.2	109.8	113.2	109.1	112.9	105.2	105.9	112.0	116.0
1939	110.6	112.5	111.1	123.6	118.7	114.2	117.6	109.3	122.6	127.6
1940	117.3	117.8	116.5	124.9	120.9	121.8	118.5	113.4	124.2	128.4
1941	126.9	125.5	124.3	126.9	124.1	132.9	119.9	118.9	126.6	129.6
1942	131.7	130.2	128.9	129.7	127.4	137.7	121.4	122.9	129.2	132.2
1943	137.8	136.2	134.8	134.7	132.0	143.9	124.0	128.9	133.7	137.0
CINCINNATI AREA										
1926–29	100.5	105.0	101.3	101.0	100.2	100.2	99.6	103.1	100.6	101.0
1939	103.3	106.2	105.9	113.9	110.4	103.3	111.7	107.1	113.7	116.5
1940	105.9	108.6	107.8	116.0	112.4	105.9	112.3	108.9	114.5	119.2
1941	112.8	114.0	113.7	116.5	114.5	114.6	112.8	112.6	116.0	118.1
1942	117.1	118.4	118.1	120.6	118.8	118.5	115.5	116.9	119.9	122.1
1943	124.2	125.0	124.8	124.5	123.6	126.1	118.7	123.8	124.2	126.3
CLEVELAND AREA										
1926–29	107.2	113.4	108.5	111.3	108.3	109.0	103.0	107.2	110.5	114.8
1939	106.2	109.6	109.5	115.3	112.8	107.5	112.9	109.5	117.7	118.0
1940	107.8	111.1	110.9	116.1	113.5	109.2	112.3	110.5	117.9	119.2
1941	118.3	120.5	120.1	122.6	120.2	121.7	116.9	118.2	124.1	125.9
1942	123.2	125.3	124.7	127.6	124.8	128.1	119.9	123.1	128.0	130.8
1943	128.6	130.0	129.4	130.3	128.1	131.9	122.0	127.0	130.3	133.2
DALLAS AREA										
1926–29	103.1	107.3	103.2	98.9	99.1	103.6	100.5	100.9	99.4	99.7
1939	95.1	95.8	96.7	98.8	100.2	94.8	106.6	96.0	101.9	98.9
1940	100.7	100.7	101.8	101.1	103.3	100.9	112.8	100.5	106.6	100.6
1941	110.6	109.2	110.2	103.3	106.7	112.2	112.2	106.0	108.9	102.5
1942	117.9	115.9	116.8	110.8	114.5	119.7	118.5	111.3	116.8	109.4
1943	126.3	125.5	125.9	123.4	125.6	128.1	123.8	120.9	126.8	125.7
DETROIT AREA										
1926–29	103.3	108.4	104.3	102.9	102.4	103.7	103.1	103.5	103.3	104.4
1939	98.8	102.7	102.9	108.6	107.5	98.7	108.8	104.2	111.4	110.1
1940	103.3	106.0	106.3	109.2	108.7	103.6	109.7	106.4	111.6	110.6
1941	113.4	114.6	114.7	114.7	114.1	114.8	112.3	113.1	116.6	116.3
1942	119.0	120.6	120.5	121.3	119.9	120.3	116.3	119.4	122.5	123.1
1943	126.7	127.9	127.6	126.5	125.4	129.4	120.1	125.9	127.4	128.6
MINNEAPOLIS AREA										
1926–29	92.8	98.2	94.6	95.6	96.1	92.8	100.0	93.9	97.9	98.4
1939	101.9	105.0	104.2	113.5	110.7	102.7	113.4	103.6	114.5	117.2
1940	106.1	108.2	107.5	113.6	111.7	107.8	113.8	105.4	115.3	117.2
1941	116.6	116.9	116.2	116.4	115.9	120.0	115.8	112.3	118.7	119.9
1942	121.2	121.4	120.6	120.5	120.9	124.5	118.9	116.8	122.7	124.2
1943	126.0	125.4	124.6	123.2	122.9	130.5	121.1	120.0	125.5	128.3
NEW ORLEANS AREA										
1926–29	93.3	96.3	93.4	86.5	90.6	93.3	93.7	91.5	89.5	86.5
1939	89.0	90.3	91.3	95.4	98.3	88.1	102.8	91.7	98.5	94.9
1940	97.3	97.4	98.1	100.3	102.2	97.3	104.7	97.9	101.6	99.2
1941	106.3	105.7	105.9	106.7	108.6	107.9	112.1	104.4	108.7	106.7
1942	110.6	109.9	110.3	110.7	113.0	114.0	118.0	108.0	114.6	111.2
1943	113.1	113.1	113.4	113.4	116.0	117.0	120.0	110.6	117.3	114.0
PHILADELPHIA AREA										
1926–29	100.3	106.3	103.7	105.9	103.1	98.1	101.9	104.2	104.1	107.5
1939	99.2	102.6	102.9	105.7	104.1	98.2	102.0	105.0	105.5	106.7
1940	103.0	105.4	106.0	106.7	106.1	102.1	104.9	107.4	107.9	107.5
1941	113.3	114.0	114.4	111.7	111.6	113.9	109.1	113.6	113.0	111.8
1942	121.8	123.5	123.6	123.1	122.0	122.7	116.6	123.0	123.2	125.1
1943	127.6	129.0	129.2	127.2	126.7	128.6	119.6	127.4	127.1	127.5

Annual Averages By Cities	Residences Frame	Residences Brick	Apartments, Hotels, Office Bldgs. Brick and Wood	Apartments, Hotels, Office Bldgs. Brick and Conc.	Apartments, Hotels, Office Bldgs. Brick and Steel	Commercial & Factory Bldgs. Frame	Commercial & Factory Bldgs. Steel	Commercial & Factory Bldgs. Brick and Wood
NEW YORK CITY AREA								
1926–29	133.3	138.4	131.9	122.8	120.4	137.5	113.1	127.4
1913	59.5	60.6	57.5	53.9	54.8	61.4	51.4	53.2
1919	100.5	103.5	99.3	92.0	96.9	101.2	97.1	97.2
1920	136.9	142.0	135.8	123.3	130.0	137.1	120.9	135.0
1921	109.8	114.5	109.2	101.3	100.8	110.0	96.1	109.1
1922	109.5	114.3	109.0	99.0	98.7	109.8	88.4	109.3
1923	124.6	131.3	125.6	112.3	112.2	125.5	103.7	127.0
1924	123.5	129.1	123.6	114.4	113.9	125.0	108.5	122.4
1925	122.8	126.9	120.4	111.4	110.1	125.7	104.2	117.5
1926	131.4	136.9	130.1	120.3	116.7	133.7	118.3	128.1
1927	128.4	133.3	126.4	117.2	113.1	131.4	106.5	123.6
1928	136.5	140.2	133.5	125.8	122.6	140.5	112.4	126.6
1929	140.6	143.2	137.6	127.9	129.2	144.4	115.2	131.3
1930	126.7	132.6	125.3	124.1	118.7	131.9	113.8	120.3
1931	117.8	124.6	117.8	119.7	113.9	122.7	116.7	113.4
1932	100.4	108.1	102.6	105.5	99.8	104.8	102.2	99.8
1933	85.0	92.4	88.4	101.1	93.3	85.2	90.1	91.0
1934	98.3	104.5	100.2	108.2	103.5	99.8	104.6	100.2
1935	92.2	92.5	93.2	103.6	99.6	94.1	102.9	92.9
1936	96.4	101.8	97.4	106.8	102.2	98.8	104.9	96.2
1937	110.5	115.8	111.2	119.6	116.5	113.1	117.8	109.1
1938	118.9	121.4	119.6	128.4	124.0	121.9	123.2	117.0
1939	122.1	123.3	122.5	130.6	125.9	125.6	123.7	119.6
1940	124.6	125.7	125.1	132.0	127.4	128.0	124.3	122.2
1941	134.6	134.1	133.3	135.0	131.3	139.4	126.6	128.7
1942	140.7	139.1	138.2	137.9	135.6	145.0	128.5	132.6
1943	144.5	142.5	141.6	140.2	138.0	150.0	130.3	135.8
PITTSBURGH AREA								
1926–29	113.3	118.8	112.8	111.2	107.1	115.4	89.6	112.2
1939	113.8	117.0	115.7	117.5	114.2	114.2	109.8	116.5
1940	115.0	117.3	116.7	117.7	114.4	115.6	109.5	117.4
1941	125.3	125.7	125.3	120.6	118.7	127.4	111.4	123.8
1942	132.7	131.1	130.6	126.0	124.4	133.9	115.4	128.6
1943	139.0	137.8	136.9	131.6	129.8	142.9	119.0	133.9
ST. LOUIS AREA								
1926–29	118.6	121.1	115.7	109.9	108.8	121.8	103.3	111.7
1913	62.6	63.7	60.0	56.7	57.3	63.9	53.4	57.8
1919	95.0	97.5	93.6	91.4	96.4	96.7	99.1	90.1
1920	121.0	123.3	118.5	112.1	120.0	123.4	116.1	113.7
1921	113.3	116.5	110.5	105.0	104.1	115.3	99.4	107.4
1922	98.1	102.4	97.9	96.2	95.7	98.7	89.6	96.8
1923	116.5	120.9	115.4	110.2	110.2	119.0	104.9	112.6
1924	122.1	126.9	120.7	117.3	114.6	125.0	109.1	117.8
1925	118.4	123.6	117.9	116.3	113.2	120.9	107.0	115.6
1926	120.7	125.4	119.6	115.5	112.8	123.8	106.5	116.5
1927	118.1	122.7	116.7	113.5	110.1	121.2	105.4	113.5
1928	117.9	119.2	114.2	106.6	97.5	121.1	102.7	110.6
1929	117.7	118.1	112.3	104.0	97.2	119.0	98.6	106.2
1930	108.3	113.2	108.4	112.4	107.9	110.6	106.2	106.0
1931	130.3	108.4	104.0	108.0	102.9	105.6	102.8	102.1
1932	95.0	100.7	96.5	99.0	94.6	97.1	97.0	95.0
1933	87.3	94.0	90.1	97.9	93.2	88.4	96.8	90.2
1934	97.6	105.5	101.7	105.9	102.3	97.2	102.6	103.7
1935	91.6	99.7	96.4	104.2	99.3	90.7	101.8	98.9
1936	91.0	99.1	95.5	104.9	100.7	90.5	103.3	98.1
1937	98.2	106.5	103.2	113.1	111.1	97.8	114.8	106.0
1938	104.1	108.5	107.5	118.5	116.4	103.7	117.1	108.5
1939	107.0	110.2	109.9	118.7	116.4	107.6	114.3	110.3
1940	109.2	111.9	111.6	119.2	117.0	109.9	113.4	111.6
1941	117.0	118.7	118.5	121.1	120.2	120.1	116.7	116.3
1942	123.3	124.5	124.1	126.9	125.9	126.3	120.9	122.3
1943	126.4	128.2	128.1	131.2	129.4	129.3	123.4	126.5
SAN FRANCISCO AREA								
1926–29	87.7	93.7	90.4	97.5	96.5	86.1	95.5	91.8
1913	51.7	56.8	55.0	63.8	61.4	49.7	68.8	57.1
1919	87.8	92.7	90.1	96.7	100.1	87.2	112.1	89.7
1920	107.5	112.8	109.8	115.2	121.1	106.9	133.0	109.6
1921	89.5	96.8	93.8	102.3	100.2	86.3	106.5	97.2
1922	88.3	94.7	91.1	97.1	95.2	86.9	94.9	92.9
1923	98.7	104.8	100.8	103.1	103.0	98.8	103.5	100.8
1924	86.7	94.2	91.2	99.9	98.0	84.6	99.7	94.3
1925	86.5	93.9	91.1	99.5	97.9	84.1	97.0	93.4
1926	88.6	96.5	92.2	103.3	100.3	87.3	100.0	95.2
1927	87.2	94.8	91.2	102.1	98.3	86.1	97.2	93.1
1928	88.1	93.2	90.1	93.1	94.9	86.0	93.5	90.8
1929	86.9	90.3	88.1	91.9	92.5	85.0	91.3	88.1
1930	86.8	93.8	90.3	100.4	96.8	86.2	100.0	92.0
1931	80.6	88.8	85.6	94.6	90.6	79.2	92.5	87.3
1932	76.4	84.3	81.6	87.9	84.0	75.4	88.0	84.6
1933	68.4	76.7	74.3	84.7	81.0	66.3	82.1	78.5
1934	85.0	93.2	90.5	97.5	94.5	82.9	97.2	94.7
1935	84.1	91.6	89.0	96.5	94.9	82.1	99.9	92.9
1936	86.5	95.6	92.3	103.5	99.8	84.8	102.6	96.2
1937	96.7	104.3	101.9	112.2	109.8	95.4	113.0	104.8
1938	97.7	105.3	101.8	115.8	112.3	96.1	115.7	105.9
1939	99.2	105.7	104.5	117.4	114.4	97.6	114.9	107.4
1940	100.7	106.0	106.0	116.4	114.1	99.6	112.2	108.1
1941	112.2	115.8	116.2	120.1	119.8	114.3	120.9	115.3
1942	120.1	123.6	123.4	127.5	127.5	121.1	127.2	123.7
1943	127.7	131.3	131.4	133.2	133.2	128.8	131.9	131.5
SEATTLE AREA								
1926–29	84.5	92.2	89.2	101.7	95.1	82.4	100.8	92.2
1939	96.7	104.4	103.8	119.2	114.9	94.4	115.1	108.3
1940	99.0	106.2	105.5	119.1	115.1	97.2	112.8	109.4
1941	109.9	115.1	114.5	123.0	119.9	109.7	118.8	116.1
1942	121.5	122.7	122.3	131.7	128.6	116.5	129.2	124.2
1943	125.4	129.7	129.2	136.6	134.1	124.4	133.7	130.8

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See page 92, Apr. 27, 1939, issue for 1914, 1915, 1916, 1917 and 1918 data of long series

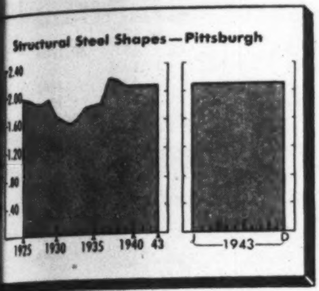
For definition of this index see p. 109

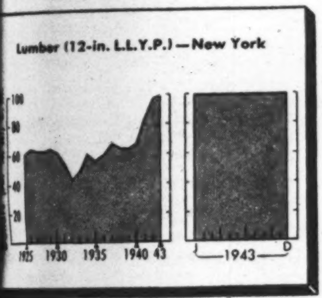
Prices of Construction Materials

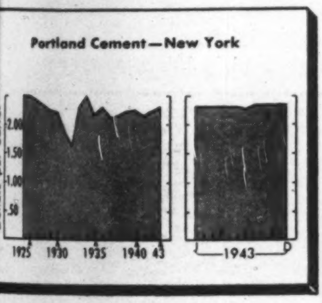
STRUCTION MATERIAL price aver- s were generally higher in 1943, gh structural steel shapes and cast n pipe prices remained unchanged m their 1942 averages. Portland cement price, not including cost of sacks, averaged $2.27 in New York City, up 3.2 percent compared with the 1942 average. Long-leaf yellow pine timbers were up 2 percent above last year in New York. The twenty-cities' average price for 2x4-in. pine, $45.93 per M ft., b.m., rose 6 percent over a year ago, and 2x4-in. Douglas fir, $51.84, was 5 percent higher.

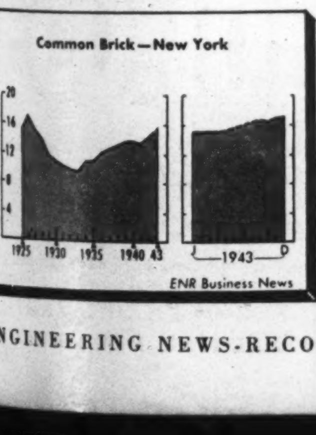
Common brick price average in New York City was $15.88 for 1943, an increase of 12 percent over the $14.17 average reported for the preceding year.

MATERIAL PRICE TRENDS









ENR Business News

Basic Building Materials Prices

1874 to 1943 in New York City

Average yearly prices at New York, except in the case of steel, which is f. o. b. Pittsburgh mill; wrought, iron I beams for years 1879, 1885 and 1886. Brick, wholesale, f. o. b. Lime, common lump, wholesale, f. o. b., 180 lb., net, 1910–15, incl.; afterward, 280 lb. Cement, net, delivered; *Rosendale, 1874 to 1878, incl.;* afterward, Portland. Lumber, No. 1 com., rough, wholesale, at dock, for 1 in., yel. pine, 1874 to 1909, incl.; afterward, 3 in., long-leaf to 1913, incl. *LLYP–3 x 12 — from Lumber Trade Journal. †LLYP–12 x 12 as reported to Engineering News-Record. Cast iron pipe price per ton f. o. b. Delaware River foundries; *prices prior to 1901 are for all classes of bell and spigot;* prices subsequent to 1901 are for 6 in. and larger Cl. B or heavier bell and spigot; early prices from "Price History of Cast Iron Pipe" by United States Cast Iron Pipe and Foundry Co.; prices 1850, $35.72; 1855, $40.18; 1860, $32.15; 1865, $58.05; 1870, $50.

	Brick Common per M	Cement Per Bbl.	Lime Per Bbl.	Pine per M. Ft. b.m.		Steel Shapes, Per 100 Lb.	Cast Iron Pipe, Per Ton
1874	$7.41	*$1.48*	$1.50	$26.00		....	*$43.76*
1875	7.12	*1.25*	1.40	21.00		....	*37.51*
1876	5.87	*1.20*	1.00	21.00		....	*31.26*
1877	4.93	*1.10*	.80	20.00		....	*25.00*
1878	4.71	*.95*	.70	20.00		....	*23.22*
1879	4.08	2.70	.80	20.96		$2.78	*29.47*
1880	7.00	2.88	.87	19.00		....	*29.47*
1881	7.50	2.72	.95	19.00		....	*33.04*
1882	7.12	2.82	1.01	19.00		....	*35.68*
1883	8.28	2.75	1.05	19.00		....	*32.15*
1884	6.65	2.60	.95	19.00		....	*26.79*
1885	6.10	2.28	1.00	18.66		3.12	*25.00*
1886	7.51	2.28	1.00	19.00		3.00	*26.79*
1887	7.43	2.07	.82	19.00		....	*28.58*
1888	6.50	2.16	.83	16.75		....	*25.00*
1889	7.06	2.23	.92	20.31		....	*23.04*
1890	6.65	2.25	.95	21.75		....	*24.65*
1891	5.53	2.38	.87	18.00		....	*23.04*
1892	5.77	2.27	.93	18.50		....	*21.43*
1893	5.83	2.15	.93	18.50		....	*21.30*
1894	5.00	2.03	.85	18.50		1.20	*18.47*
1895	5.31	1.97	.78	16.92		1.35	*17.95*
1896	5.06	2.00	.69	16.42		1.30	*17.64*
1897	4.94	1.97	.72	16.44		1.24	*15.48*
1898	5.75	2.00	.70	15.75		1.27½	*15.48*
1899	5.69	2.05	.75	16.25		1.45	*21.17*
1900	5.25	2.16	.68	24.50		1.95	*22.33*
1901	5.77	1.89	.77	17.50		1.60	*21.63*
1902	5.39	1.95	.81	21.00		1.60	26.62
1903	5.91	2.03	.79	23.50		1.70	27.56
1904	7.50	1.67½	.80	21.50		1.60	22.92
1905	8.10	1.43	.89	24.92		1.62	26.54
1906	8.55	1.55	.95	29.33		1.60	30.12
1907	6.16	1.55	.95	30.50		1.75	31.52
1908	5.10	1.46	1.05	30.50		1.76	24.69
1909	6.39	1.41	1.05	33.04		1.50	24.19
1910	5.70	1.07	.75	24.00		1.46	22.99
1911	5.31	1.04	.75	24.63		1.36	19.99
1912	6.75	.97	.75	24.92		1.33	21.22
1913	6.75	1.18	.91½	* 25.04 †		1.50	21.96
1914	5.50	1.17½	.97	21.79	29.25	1.16	20.37
1915	5.50	1.00	.97	21.68	27.91	1.28	22.52
1916	8.00	1.32	1.50	27.60	31.58	2.45	30.25
1917	9.10	1.76	2 02	38.00	37.81	3.62	52.33
1918	10.98	2.48	2.16	46.68	43.33	3.00	58.68
1919	15.79	2.63	2.65	57.04	49.60	2.52	53.87
1920	18.00	3.52	3.15	71.17	66.50	2.45	71.77
1921	17.40	2.82	3.47	50.67	51.54	2.00	50.58
1922	16.91	2.43	2.79	49.41	51.83	1.70	46.42
1923	20.00	2.66	2.98	61.77	62.25	2.39	57.75
1924	18.00	2.50	2.88	55.17	59.00	2.19	54.33
1925	15.00	2.50	2.38	57.00	59.67	1.95	49.16
1926	17.00	2.50	2.18	60.33	62.17	1.93	48.50
1927	15.00	2.40	2.49	62.57	61.46	1.86	41.42
1928	14.00	2.30	2.30	63.33	61.34	1.87	35.92
1929	11.71	2.23	2.25	64.50	63.00	1.92	36.66
1930	10.88	2.19	2.25	64.33	60.64	1.71	37.00
1931	10.29	1.89	2.25	58.17	53.02	1.63	34.71
1932	9.75	1.62	2.25	39.91	41.33	1.56	30.58
1933	9.50	2.26	2.50	46.25	46.79	1.64	34.58
1934	10.87	2.48	2.50	57.17	58.92	1.78	41.00
1935	11.00	2.15	2.35	51.67	53.75	1.80	42.58
1936	12.00	2.26	2.80	56.75	57.75	1.84	43.00
1937	12.50	2.07	2.80	61.50	66.46	2.21	48.75
1938	13.10	2.12	2.80	59.33	62.75	2.18	48.33
1939	13.46	2.20	2.80	64.35	62.50	2.10	46.75
1940	13.50	2.20	2.68	67.39	65.46	2.10	49.00
1941	13.13	2.15	2.66	75.50	83.33	2.10	49.00
1942	14.17	2.20	2.80	85.61	98.33	2.10	49.00
1943	15.88	2.27	2.80	88.81	100.00	2.10	49.00

INDEX NUMBERS OF WHOLESALE PRICES—BUREAU OF LABOR STATISTICS

(1926 = 100)	1943	1942	1941	1940	1939	1938	1937	1936	1935	1934
Building materials	111.4	110.2	103.2	94.8	90.5	90.3	95.2	86.7	85.3	86.2
Brick and tile	99.1	98.0	93.7	90.5	91.4	91.0	93.5	88.7	89.4	90.2
Cement	93.8	94.0	92.0	90.8	91.3	90.3	89.0	92.2	92.7	93.1
Lumber	138.5	132.8	122.5	102.9	93.2	87.4	99.7	87.0	81.1	84.5
Paint and paint materials	102.3	100.3	91.4	85.7	82.8	81.3	83.4	80.1	79.8	79.5
Plumbing and heating	90.7	95.4	84.8	80.4	79.2	78.5	78.8	75.0	68.9	72.6
Structural steel	107.3	107.3	107.3	107.3	107.3	111.0	113.2	95.0	92.0	90.8
Other building materials	102.0	103.5	98.3	93.3	90.3	92.7	99.1	90.2	90.1	90.3

Materials and Labor Prices, December, 1943

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

CONSTRUCTION MATERIAL prices for December reveal only minor changes from a month ago in the twenty cities reporting to *Engineering News Record.*

Short-leaf yellow pine is $2.50 to $4.00 per M ft., board measure, higher in Dallas; and rough long-leaf yellow pine timber is mixed there, up $5.50 on the 2x12-in. size, and off $2.50 on the 12x12-in. size.

Portland cement is up 20c. per barrel in Los Angeles. Sand and gravel are lower in Detroit. Ready mixed concrete is up 50c. in Detroit, and is 25c. higher in Minneapolis due to a heating charge. Paving asphalt in drum $4.00 per ton higher in Seattle.

Brick is $1.00 per M lower in Kansas City on both the common clay the straight hard. Roofing supplies are up 15c. on slate-surfaced rolls, up 9c. on asphalt felt and tar felt in Detroit.

Skilled and common construction labor rates are unchanged from a ago in all of the twenty cities.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F. O. B. CITY

	PORTLAND CEMENT Per bbl., C/L lots, incl. 40c. per bbl. for bags, cash dis. not deducted			SAND AND GRAVEL Per ton, carload lots			CRUSHED STONE Per ton, carload lots		CRUSHED SLAG Per ton, carload lots, f.o.b. plant		CONCRETE BLOCK 8x8x16-in.; truckload del.; per block	
	Cloth *a*	Paper	Bulk	Gravel, 1½ in.	Gravel ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	Sand-grav.	Lt. wgt.Agg.
Atlanta	$2.77	$2.52	$2.47	$1.79	$1.89	$1.99	$1.79	$1.89	$1.59	$1.69	$0.17	....
Baltimore	2.33	2.08	1.88	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	.125	$0.125*w*
Birmingham	2.50	2.25	2.10	1.75	1.75	1.50	.85	1.00	.90	1.15	.1425	....
Boston	2.75*b*	2.40*b*	2.30	1.40‡	1.40‡	1.00‡	1.40‡	1.40‡	....	....	.135	.135*w*
Chicago	2.70	2.45	2.30	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	1.75‡	1.75‡	.16	.16*x*
Cincinnati	2.31	2.06	1.81	1.20	1.20	1.10	1.80	1.80	....	....	.12	.15*w*
Cleveland	2.40	2.15	....	1.70*i*	1.70*i*	1.60*i*	1.70*i*	1.70*i*	1.75*i*	1.75*i*	.14	.14
Dallas	2.52	2.27	2.07	1.50*p*	1.70*p*	1.10*p*	1.69*p*	1.79*p*	....	....	.15	....
Denver	3.08	2.88	2.32	1.20	1.30	1.25	1.65	1.75	1.00	1.00	.15	.15*w*
Detroit	2.39	2.14	1.99	1.50	1.50	1.50	2.25	2.25	2.00‡	2.00‡	.16	.16*w*
Kansas City	2.58	2.33	2.18	1.85	2.30	1.00	1.91	1.91	....	....	.125	.125*wy*
Los Angeles	3.00*r*	2.40*v*	....	1.30	1.30	1.15	1.30*f*	1.30*f*	....	....	.04*bb*	.10*aa*
Minneapolis	2.90	2.65	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	.12	.16
Montreal	....	1.95*r*	1.79*r*	....	1.65‡*t*	2.05‡*t*	1.05‡*t*	1.15‡*t*	....	....	.14*c*	.14*wc*
New Orleans	2.41	2.16	1.96	1.65	1.65	.90	....	....	....	....	.19	....
New York	2.69‡	2.44‡	....	1.60*de*	1.60*de*	.90*de*	1.70*de*	1.80*de*	....	....	.14*cc*	.14*wcc*
Philadelphia	2.33	2.08	1.88	1.55‡	1.65‡	1.20‡	1.90	1.95	1.10	1.10	.155	.155*w*
Pittsburgh	2.45	2.20	2.00	1.65‡	1.65‡	1.85‡	2.25‡	2.25‡	1.50	1.50	.17	.17*z*
St. Louis	2.80	2.52	....	1.75‡	1.50‡	1 25/1.50‡	1.10*h*	1.10*h*	.75*g*	.75*g*	.125	.165*w*
San Francisco	....*u*	2.21	1.91	1.36	1.36	1.36	1.46	1.46	....	....	....	.20*aa*
Seattle	2.95*o*	2.75*o*	....	1.00*o*	1.00*o*	1.00*o*	2.00*o*	2.00*o*	....	....	.16	.16*y*

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 2 percent for cash in 10 days. *l* Up to 200 cu. yd. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% not included. *u* Price withdrawn. *v* 20c. per bbl. discount; 20c. allow returnable cloth bag. *w* Cinder. *x* Waylite. *y* Haydite. *z* C *aa* Pumice. *bb* 4 x 8 x 12 in. *cc* Also 8 x 18 x 18 in.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash 10c. per bbl. for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable

	Bagged	Bulk
Buffington, Ind	$1.70	$1.65
Dallas, Tex. (Inc. 9c. tax)	1.84	1.79
Hannibal, Mo	1.70	1.65
Hudson, N. Y	1.75	1.70
Independence, Kans	1.70	1.65
Ironton, Ohio	$1.60	$1.55
Limedale, Ind	1.70	1.65
Norfolk, Va	1.75	1.70
Northampton, Pa	1.55	1.50
North Birmingham, Ala	1.70	1.65
Richard City, Tenn	$1.80	
Steelton, Minn	1.80	
Universal, Pa	1.65	
Waco, Tex. (Plus 9c. tax in Tex.)	1.75	
Montreal (8% sales tax incl.) Discount 10c. per bbl. 20 days	1.68	

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F. O. B. CITY

	PAVING BRICK AND BLOCK			PAVING ASPHALT Per ton, less than 80 penetration		ASPHALT BINDERS—FLUXES Per gal., 80–300 penetration		CUTBACK ASPHALT Per ton		ROAD OIL Per gal.	ASPHALT EMULSION (Quick-breaking) Per gal.
	Granite per M. lots of 50,000 4x4x8 in.	Brick per M 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car
Atlanta	$73.00	$39.35	$2.25	$18.53*e*	$24.62*e*	$0.0740*e*	$0.1309*e*	$0.0802*he*	$0.1348*h*	$0.0676*e*	$0.0826
Baltimore	150.00‡	48.00	80.00*m*	15.00*r*	21.00*r*	.06*r*	.09*r*	13.00*r*	23.00*r*	.065*r*	.07*r*
Birmingham	150.00	48.00	.....	17.95	.....†	.0747	......†	.0834*h*	......†	.065	.09
Boston	80.00	57.00	3.75	14.20	20.00	.06	.09	.065*h*	.115*h*	.065	.09‡
Chicago	150.00	55.00	1.80/2.00*d*	14.00	22.50	13.00*g*	21.50*g*	.0575*h*	.15*h*	.05*n*	.09/10*n*
Cincinnati	120.00	50.00	.....	16.40	.....	.085	....	12.25	....	.07	.085
Cleveland	118.00	37.50	2.25	19.00	20.00	.09	.105	.10*h*	.15	.105	.09
Dallas	......	36.00	.....	13.65	20.30	.06	.11	16.00	24.80	.06	.05/.07
Denver	......	66.11	.....	11.00	.....	10.00	....	.045*h*	....	....	....
Detroit	......	37.50	.....	18.06*f*	25.60*f*	.0743	.128	.0718*h*	.119*h*	.067	.0775
Kansas City	......	40.00	.....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11
Los Angeles	......	50.00	.....	9.00*b*	23.00	9.50*bg*	24.00*bg*	9.50*b*	....	.025	.072
Minneapolis	......	.....	2.30*d*	.....	27.70	....	.126	....	32.64	....	....
Montreal	92.40	.....	.....	16.60*k*	24.25*k*	.116*k*	.1485*k*	.115*hk*	.135*hk*	.08*k*	.135*k*
New Orleans	......	.....	.....	13.50*a*	20.00*a*	.057	.088	.06*h*	.095*h*	....	.080
New York	......	70.00	.....	17.40	24.20*p*	14.00	....	.0725*h*	.1325*hp*	....	.0725*p*
Philadelphia	140.00	58.00	4.06	15.00*r*	.....	14.00*r*	....	.065*hr*	....	....	14.00*gr*
Pittsburgh	135.00	38.75	.....	18.00	23.00	.09	.16	20.00	36.00	.07	.06
St. Louis	......	37.00	.....	16.00	22.00	15.00*g*	21.00*g*	.0575*h*	.1213*h*	.648	.0525
San Francisco	......	40.00	.....	10.90	21.15	10.90*gr*	18.00*gr*	12.90	17.50*r*	9.50*gr*	.0525
Seattle	......	60.00*c*	.....	10.90*i*	23.40*i*	....	20.40*gi*	11.40*i*	....	....	.0525*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 12-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martinez. *j* 3x3¾x8½ in. *k* Tax included. thousand. † Available on priority only and quoted specially. *p* No steel shipments except to armed forces. *r* February 1943 prices, none later avail

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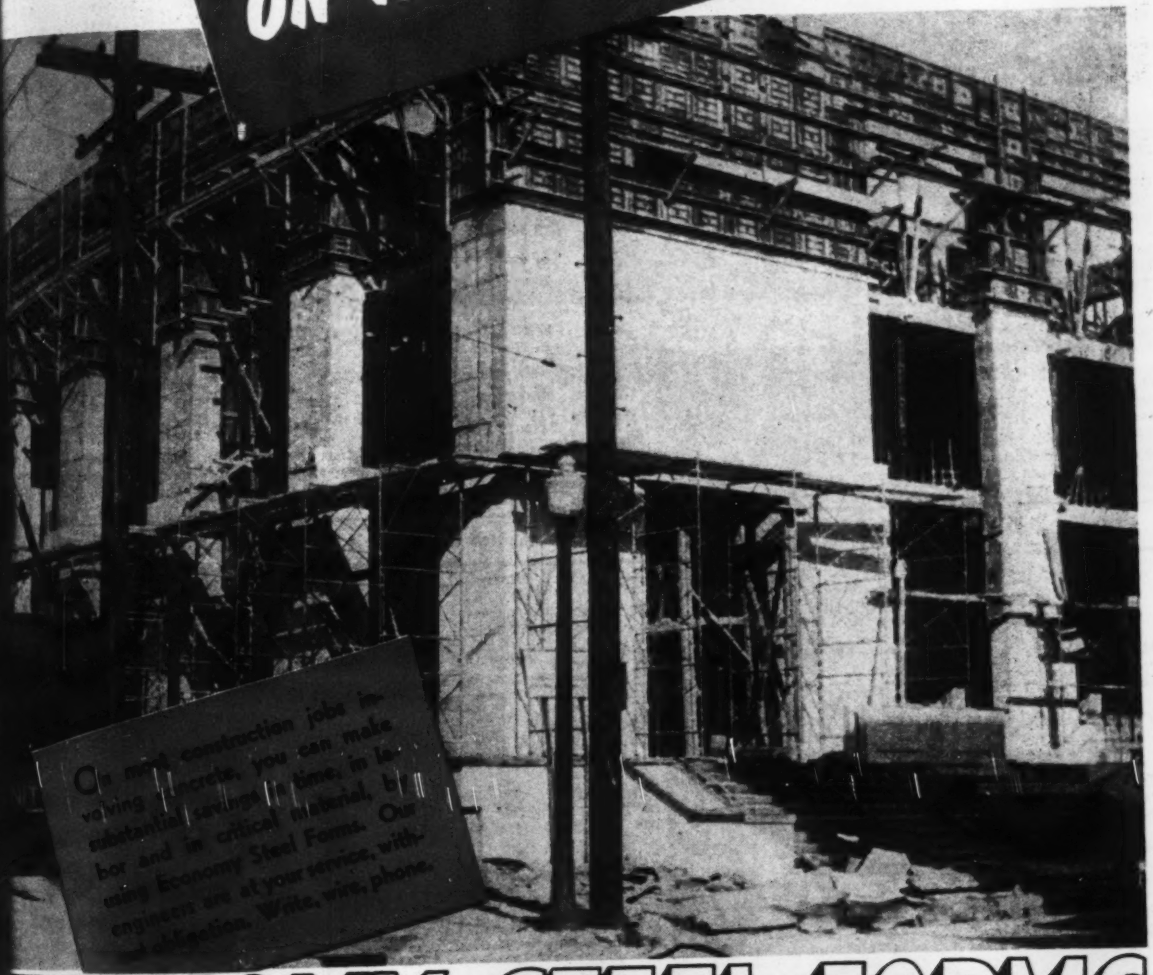


December, 1943

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ½-in billet *b*	RIVETS ¾-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton Standard	Light	Re-rolled	TRACK SUPPLIES Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham...	$2.10	$2.15	$3.75	$2.55	.....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	$4.75
Chicago.......	2.10	2.15	3.75	2.55	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Pittsburgh.....	2.10	2.15	3.75	2.55	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.75
Buffalo........	2.10	2.15	.....	.....	2.40	.....	.....	.....	.....	.....	2.15	.....
Cleveland......	2.10	2.15	3.75	2.55	.....	.....	.....	.....	.....	.....	.....	.....
Youngstown...	.....	2.15	.....	.....	.....	.....	.....	.....	.....	3.00	.....	.....
Detroit........	.....	2.27‡	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Gulf ports.....	2.47*a*	2.52*a*	.....	.....	2.85*a*	.....	.....	.....	.....	.....	.....	.....
Pacific ports...	2.75*a*	2.80*a*	.....	3.05	2.95*a*	.....	.....	.....	.....	.....	2.30	.....

‡ Delivered. *a* F.o.b. cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone, Steelton, Pa., spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ½ in., base price 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq. yd., carload lots Std. diamond mesh, 3.4 lb	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 sq.yd., carload lots 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 · 6 wires Per sq. yd	SHEET PILING Per 100 lb. base price
Atlanta..........	$2.34	$2.40	$2.40	$.02½	$.10	$21.06	$23.00	$1.82	$1.35	$0.1719	$3.04
Baltimore........	3.70	2.90	2.75	......	.10	22.50	24.50	1.70	1.27	.1611	3.00
Birmingham.....	2.10*a*	2.15	2.15	.02½	.10	19.00	21.00	1.80	1.34	.1701	....
Boston..........	3.85	3.51	3.36	$20 C.L.	.10	18.50	29.50	1.76	1.31	.1656	2.70
Chicago.........	2.10*a*	2.15	2.15	.03	.05	21.50	23.50	1.67	1.25	.1575	2.40
Cincinnati.......	3.68	2.53*cd*	2.53*cd*	......	.05	19.50	21.50	1.66	1.25	.1566	....
Cleveland.......	2.10*a*	2.15	2.15	.02½	.10	19.50	21.50	1.66	1.25	.1566	....
Dallas...........	4.25	3.17	3.17	......	....	25.00	27.50	1.93	1.42	.1827	....
Denver..........	4.57	4.842	3.85	......	....	26.50	26.50	1.97	1.45	.186	....
Detroit..........	3.65‡	2.52‡	2.52‡	......	.10	30.00	30.00	1.68	1.26	.1584	2.88
Kansas City.....	4.19	2.61*cd*	2.61*cd*	.0	.05	24.50	26.50	1.78	1.33	.1683	2.874
Los Angeles......	3.65*f*	2.575	2.425	.02½	.05	23.00	27.50	1.93	1.42	.1827	3.65
Minneapolis......	3.81‡	2.73	2.73	.0	.10	25.00	27.00	1.80	1.34	.1701	2.734
Montreal........	4.00*i*	2.90*i*	2.80*i*	......	....	26.00*hij*	33.00*hij*	2.56*i*	3.14*i*	.268*i*	....
New Orleans.....	4.229‡*k*	2.52	2.52	.05	.10	21.50	23.50	1.82	1.35	.1715	2.875
New York.......	3.75	2.76*c*	2.76*c*	......	.15	17.50	19.50	1.76	1.32	.1665	2.74
Philadelphia.....	3.66	3.82	....	......	....	19.50	21.50	1.71	1.28	.1611	2.72
Pittsburgh.......	2.10*a*	2.15	2.15	.02½	.10	23.00	26.50	1.59	1.20	.1503	2.40
St. Louis........	3.697	2.74	2.74	.0	.05	28.00	34.00	1.69	1.27	.1602	2.70
San Francisco....	4.35	2.825	....	.02½	.10	21.00	24.50	1.93	1.42	.1827	3.85
Seattle..........	2.75*e*	2.80*e*	....	......	....	34.50	38.50	1.93	1.42	.1827	2.95*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. * High scrap steel prices cut former 15c. differences between billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *j* August 1942 price; not on market. *k* Quotation on changed basis; actual price change.

PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

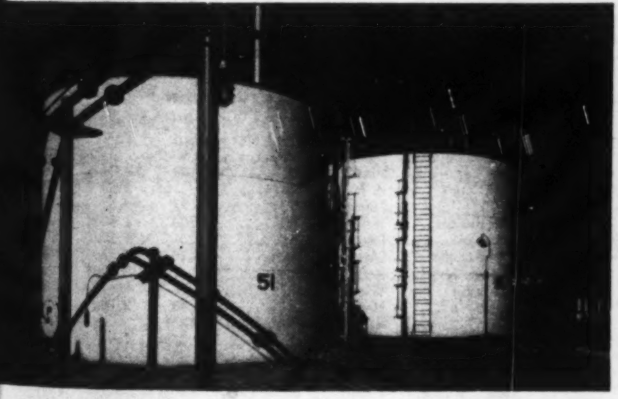
	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE Per foot, std. 8 in., s.s.	Delivered std. 12 in., s.s.	ASTM 24 in.,	C13–35 36 in.,	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h* 1 to 3 in., Butt Weld Black %	Galv. %	3½ to 6 in.; Lap Weld Black %	Galv. %
Atlanta..........	$49.66	$0.26*b*	$0.468*bc*	$1.8525	$4.68*c*	$85.00	$128.00	$0.45	$1.642	48.2	54.2	59.7	51.2
Baltimore........	53.00	.35	.60	2.65	7.25	160.00	200.00	.50	1.75	65.5	57.5	63.0	54.5
Birmingham.....	45.00	.275	.495	1.95	5.50	100.00	220.00	.50	1.70	62.2	54.2	59.7	51.2
Boston..........	55.40	.26	.463	2.07	5.85	140.00	......	.60	......	....	....	....	....
Chicago.........	54.33	.35	.675	2.70	7.00	100.00‡	150.00‡	.45	1.85	66.0	55.0	64.5	53.0
Cincinnati.......	53.27	.231	.4455	1.80	5.125	105.00	170.00	.60	1.70	57.1	43.4	54.0	39.8
Cleveland........	54.75	.196	.378	1.62	4.715	81.00	125.00	.30	1.60	68.5	57.5	66.0	54.3
Dallas...........	56.43	.31	.58	2.25	5.00	90.00	110.00	.46	1.57	59.9	51.9	57.3	48.3
Denver..........	61.56	.29†	.52†	2.16†	3.00*n*	125.00	200.00	1.00	2.22	58.4	50.4	55.7	47.2
Detroit..........	54.75	.35	.675	2.70	7.75	135.00	180.00	.40	1.75	57.7	44.0	54.8	40.6
Kansas City.....	55.73	.315	.39	2.20	5.86	140.00	260.00	.45	1.60	35.6	46.1	46.2	39.4
Los Angeles......	68.40	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	61.1	50.1	58.6	47.1
Minneapolis......	59.00	.275†	.495†	1.98†	5.37†	......	......	.90	2.10	64.2	53.2	60.7	49.2
Montreal........	60.00	.85*o*	1.50*o*	5.25*p*	8.50*ep*	45.00*m*	64.00*m*	.48*m*	1.92*m*†	....	....	....	....
New Orleans.....	51.78	.26	.48	1.69	......	150.00	220.00	.45	1.65	62.4	54.4	58.8	50.3
New York.......	52.40	.322	.621	2.61	6.65	......	......	.60	1.40	64.9	53.9	62.4	50.9
Philadelphia.....	51.00	.30	.58	2.50	7.50	150.00	225.00	.45	1.75	56.6	42.8	53.6	39.1
Pittsburgh.......	56.00	.245†	.4725†	1.845†	5.4325	97.80	154.20	.85*g*	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5*i*
St. Louis........	53.62	.28	.504	2.016	4.50	85.00	220.00	1.00*j*	2.15*k*	56.4	42.6	52.5	38.4
San Francisco....	68.40	.3625*d*	.6525*d*	2.61	6.52	115.00	192.50	.58	2.34	45.0	31.0	41.0	26.0
Seattle..........	70.20	.375	675	2.70	6.75	84.00	187.50	.51*f*	1.44*f*	....	....	....	......

‡ Delivered. †F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N.J. (base) $49.00. Based on existing freight rates; subject to rate change. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.; ¼ in., 8½c.; ⅜ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. 3 percent tax on transporation costs not included. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points le on butt, 1½ on lap. Freight is figured from Pittsburgh, Lorain, O., Chica Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld—1 in. and 1¼ in. black 34, galv. 16; 1½ in. black 38, galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½, galv. 14½; 4½ in. to 8 in. black, 32½ galv. 17. *j* Reinforced; spec. C 76–37. *k* Reinforced; spec. C 75–37. *l* Plus sales tax. *m* Tax included. *n* 27-in. pipe. *o* Less 50%. *p* Less 53%.

. . . . . the DAWN OF A NEW DAY in the Synthetic Rubber Industry . . .

NEW DAY dawned in the synthetic rubber industry when the plant at which these tanks are located was ed in operation in September, 1941. Since that time it been producing enough butadiene to make thousands ns of GR-S type synthetic rubber.

uring the past four years we have built storage tanks these, as well as Hortonspheres and Hortonspheroids storing charging stock and other volatiles under pres- , for many other synthetic rubber projects, aviation line refineries and chemical plants.



. diam. by 18-ft. riveted acid storage tanks at the same butadiene plant he processing tanks shown above.

Close-up view of the 18-ft. diam. by 24-ft. welded tanks in the row at the left in the above view.

CHICAGO BRIDGE & IRON COMPANY

go 4............2101 McCormick Bldg.
York 6........3311-165 Broadway Bldg.
land 15...........2201 Guildhall Bldg.
Philadelphia 3..1623-''1700' Walnut St. Bldg.
Tulsa 3 ....1617 Hunt Bldg.
Birmingham 1......1520 North Fiftieth Street
Washington 5..............330 Bowen Bldg.
Houston 1................5609 Clinton Drive
San Francisco 5............1020 Rialto Bldg.

s in BIRMINGHAM, CHICAGO, and GREENVILLE, PENNA. In Canada—HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

December, 1943

LUMBER, TIMBER PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face)
All Fir planks No. 2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)

LONG LEAF Y. P. Merchantable grade up to 20 ft.

PLYWOOD Rail freight incre (See note for base pr

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR									LONG LEAF Y. P.		PLYWOOD
	1x6 S4S	1x8 S4S	2x4 S4S	2x6 S4S	2x8 S4S	2x10 S4S	3x12 Rgh	6x12 Rgh	12x12 Rgh	2x12 Rgh	12x12 Rgh	⅝″
Atlanta	**$37.00**	**$37.00**	**$32.00**	**$31.00**	**$31.00**	**$34.50**	**$49.00**	......	......	$58.00	$66.00	$17.90
Baltimore	**42.00**	**45.00**	**42.00**	**42.00**	**43.00**	**48.00**	**65.00**	......	......	115.00	120.00	18.25
	48.00	*48.00*	*55.00*	*55.00*	*55.00*	*55.00*	*68.00*	*$70.00*	*$70.00*	......	......	......
Birmingham	**34.50**	**36.50**	**32.00**	**32.00**	**34.00**	**34.00**	**53.00**	**53.00**	**56.00**	......	......	17.35
[1]	37.50	37.50	37.00	37.00	37.00	43.00	65.00	......	......	67.50	70.00	......
Boston ‡*	42.00[8]	45.00[3]	55.00[8]	60.00[8]	60.00[8]	65.00[3]	75.00[8]	......	......	85.00[8]	......	18.25
‡*	*50.00*	*50.00*	*55.00*	*60.00*	*65.00*	*70.00*	*80.00*	*85.00*	*85.00*	......	......	......
Chicago	**50.00**	**51.00**	**50.00**	**49.00**	**50.00**	**54.00**	**67.00**	......	......	80.00l	95.00l	14.60
	50.00	*50.00*	*47.50*	*47.00*	*47.00*	*48.00*	*57.00*	*56.00*	*58.00*	......	......	......
Cincinnati	**41.00**	**42.50**	**39.00**	**40.50**	**42.00**	**43.00**	**53.00**	......	......	65.00	68.00	17.35
	......	......	......	......	......	......	*55.50*	*55.50*	*55.50*	......	......	......
Cleveland	**42.50h**	**42.50h**	**52.50k**	**51.00k**	**65.00**	**65.00**	**83.00**	83.00	**83.00**	......	......	17.75
Dallas e	**44.25**	**44.25**	**41.50**	**40.00**	**40.00**	**42.00**	57.50	**55.50**	**55.00**	83.50	80.50	14.60
Denver ‡	64.00[6]	62.00[6]	65.00[6]	65.00[6]	65.00[6]	66.00[6]	69.00[6]	*83.00*	*89.00*	......	......	10.45
Detroit	**61.00**	**61.00**	**57.75**	**57.75**	**57.75**	**62.75**	**72.75**	......	90.00	70.75	90.00	17.35
	57.00	57.00	57.00	57.00	62.75	*63.75*	*71.00*	*75.00*	*75.00*	......	......	......
Kansas City a	**64.00**	**64.00**	**62.00**	**60.50**	**62.00**	**64.00**	**79.00**	......	......	79.00	89.00	12.60
	60.00	*60.00*	*58.00*	*58.00*	*58.00*	*58.00*	*75.00*	*80.00*	*80.00*	......	......	......
Los Angeles a	*58.50*	*58.50*	*58.50*	*59.00*	*60.25*	*60.25*	*75.75*	*74.25*	*74.25*	......	......	9.90gh
Minneapolis ‡b	59.00[8]	59.00[8]	......	......	......	......	......	......	......	......	......	12.60
‡	*55.50*	*55.50*	*54.25*	*54.50*	*53.50*	*54.75*	*64.75*	*63.50*	*63.50*	......	......	......
Montreal †[7]	*52.00*	*55.00*	*48.00*	*52.00*	*54.00*	*60.00*	......	......	......	200.00	200.00	......
	48.50	*48.50*	*45.25*	*45.25*	*45.25*	*46.75*	*50.00*	*50.00*	*50.00*	......	......	......
New Orleans	**37.50**	**37.50**	**32.50**	**31.50**	**31.50**	**35.00**	**46.00**	......	......	52.50	69.00	14.60
	31.00	*31.00*	*33.00*	*31.00*	*34.00*	*32.00*	*35.00*	......	......	......	......	......
New York	**60.50**	**61.50**	**56.25**	**55.25**	**56.25**	**59.50**	**67.50**	......	......	120.00f	125.00f	18.35
‡	......	......	*65.00i*	*65.00i*	*65.00i*	*65.00i*	[Range from $75 to $95]			......	......	......
Philadelphia	**65.00**	**63.00**	**62.00**	**61.00**	**61.00**	**64.00**	**84.00**	......	......	126.00	122.00	18.25
	[$70.00 to $85.00]		*75.00*	*75.00*	*75.00*	*75.00*	*77.50*	*$85 to $105*	*$85 to $105*	......	......	......
Pittsburgh	**50.80**	**53.20**	**62.75**	**55.00**	**60.85**	**62.50**	**76.25**	......	......	......	......	18.10
	69.20	*68.10*	*66.10*	*65.30*	*65.20*	*65.65*	*88.75*	*88.75*	*88.75*	......	......	......
St. Louis ‡c	**56.00**	**56.00**	**53.00**	**52.00**	**53.00**	**56.00**	**69.00**	*75.00*	*75.00*	86.00	85.00	14.60
San Francisco d	*36.00*	*36.00*	*34.00*	*34.00*	*33.25*	*33.25*	*39.00*	*38.25*	*38.75*	......	......	7.30g
Seattle	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*35.00*	*40.00*	*40.00*	*40.00*	......	......	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [6] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* F.o.b. cars San Francisco freight rate. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax. * Prices for truck delivery; no longer quoting carload lots f. o. b. city.

Note: Special concrete form grade Fir Plywood, 4′ by 8′ panels, 5-ply, 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. Seattle base price on ⅝″, $95.15; on ¾″, $104.85; price includes oiling and ing charges. For other centers add rail freight increment from table or size. For resin dipped treatment, add $10.50 per M. *g* Lower rate by shipment. *h* 50,000 lb. minimum. *i* Ranges from $65 to $69. *j* Average *k* August price. *l* September price; none later available.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS Discounts from jobbers list, Aug. 15, 1938 Single or Double Thickness A quality	B quality	EXPLOSIVES Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb lots*
Atlanta	75%	75%	$0.15
Baltimore	78%	79%	.15
Birmingham	76%	76%	.105
Boston	77%	78%	.15
Chicago	77%	77%	.15
Cincinnati	77–10%	77–10%	.15
Cleveland	77–10%	77–10%	.19
Dallas	76%	76%	.1625
Denver	76%	76%	.155e
Detroit	77%	77%	.1575
Kansas City	77–10%	77–10%	.155
Los Angeles	86%d	88%d	.1575
Minneapolis	77%	77%	.155
Montreal	40–5%‡	47%‡	.1675†
New Orleans	70%	75%	.16
New York	81%	82%	22f
Philadelphia	78%	79%	.15
Pittsburgh	79%	79%	1225
St. Louis	77–10%	77–10%	.155
San Francisco	66%	73%	.155
Seattle	75%	75%	.1575†

Price of 60% Ammonia Gelatin in $0.01 per lb. higher than 40%

a Disc. from list Sept. 1939. *b* Also less 6% tax exemption. *d* Discount from jobbers' list Sept. 15, 1928. ‡ Sales tax included.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me.	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine.	.11 –.1175	.135 –.1475	.155 –.1675
Rocky Mtn. States	.11 –.1225	.135 –.1525‡	.155 –.1725‡
Pacific N. W. States	.1075–.12	.1375–.15	.1575–.17
Pacific S. W. States	.1050–.1125	.135 –.1425	.155 –.1625

‡ F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES—F.O.B.

PILES

Prices per linear foot, fir and pine, bark on, f.o.b. cars, New York. Fir on Wash. and Ore. points to New York shipping area; pine based on freight Norfolk.

Dimensions	Points	Length	By Rail Pine
12-in. at butt	6-in.	30 to 50-ft.	$0.33
12-in.— 2-ft. from butt	6-in.	50 to 59-ft.	.34
12-in.— 2-ft. from butt	6-in.	60 to 69-ft.	.35
12-in.— 2-ft. from butt	6-in.	90 to 100-ft.	....
13-in.— 3-ft. from butt	5-in.	91 to 100-ft.	....
14-in.— 2-ft. from butt	6-in.	50 to 69-ft.	.40
14-in.— 2-ft. from butt	6-in.	70 to 79-ft.	.41
14-in.— 2-ft. from butt	5-in.	80 to 85-ft.	.52
14-in.— 2-ft. from butt	5-in.	85 to 89-ft.	.55
14-in.— 2-ft. from butt	5-in.	90 to 100-ft.	....

RAILWAY TIES

Prices f.o.b., per tie for carload lots:		6″x8″x8′ Untr.	6″x8″x8′ Tr.	7″x9″x8′6″ Untr.
Boston	Oak	$1.50	....	$2.00
	Pine	2.00	$3.00a	2.50
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76
	Mixed Oak	1.71	2.59	2.42
Birmingham	White Oak	1.00	1.60a	1.30
Chicago	Red Oak	....	2.19a	....
Los Angeles	Douglas Fir	1.10	1.75a	1.60
Philadelphia	Red Oak	....	2.10ag	....
St. Louis	White Oak	1.48	....	2.04
	Red Oak	1.48	2.05a	2.04
	Sap Pine or Cypress	1.35	....	1.91
San Francisco	Douglas Fir	1.25bef	....	....
Montreal	Birch or Maple	.85	.95	....†

Tr.— Treated; Untr.— Untreated. *a* Creosoted *b* 6″x8″x8′6″. *c* cell. *d* Zinc. *e* Green. *f* F.o.b. cars. † Out of market. *g* January none later available.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

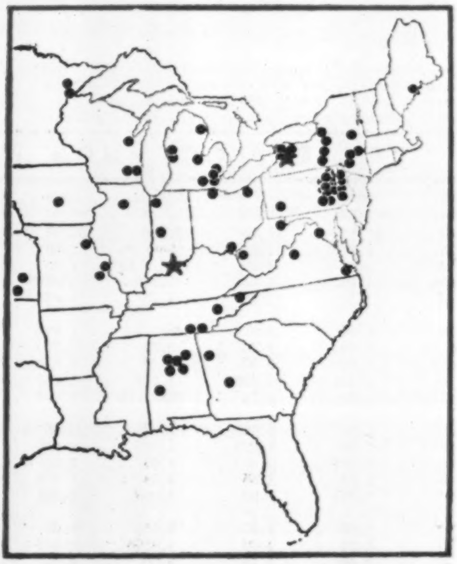
Bleaching powder, in drums, f.o.b. works, per 100-lb.	$2.50-
Chlorine cylinders, liquid, per lb. delivered	
Calcium chloride, 77–80%, flaked, 100-lb. paper bag, del'd, ton	18.50-
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb.	
Soda ash, 58%, in paper bags, per 100 lb. dense	
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-
Sulphate of copper, in bbl., per 100-lb	

BRIXMENT
A
CEMENT
FOR
MASONRY
BRIXMENT
PATENTED
TRADE MARK REG U S PAT OFF
LOUISVILLE CEMENT CO
INCORPORATED
OFFICES
LOUISVILLE, KY.
MILLS
BRIXMENT, N.Y.
SPEED, IND.
BRIXMENT

RIXMENT—*the* *Leading Masonry Cement*

or twenty-five years, Brixment has been gnized as the *best* masonry cement on the ket. Government statistics show that it is ar the largest-selling and most widely-used d. It is universally considered the standard ll masonry cements.

ing recent years, of course, a number of ewhat similar products have been brought in an attempt to compete with Brixment. none of them can use the same raw erials and the exclusive Brixment process. refore, no other masonry cement combines such a high degree the same plasticity, ngth, bond, water retention, and freedom efflorescence. It is this *combination* of ntages that makes Brixment superior to r masonry cements, and *especially* to any ture of portland cement and lime.



Red stars indicate the two mills at which Brixment is made — the black dots indicate the mills of other cement companies which stock Brixment for shipment in mixed cars with their own portland cements.

LOUISVILLE CEMENT COMPANY, Incorporated
General Offices: Louisville 2, Kentucky
Cement Manufacturers Since 1830

December, 1943

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE—PARTITION—SCORED Per M. lots of 2,000 pieces or over, 3x12x12 in.	4x12x12 in.	8x12x12 in.	STRUCTURAL CLAY TILE—LOAD BEARING—SCORED Per M. lots of 2,000 pieces or over, 8x12x12 in.	10x12x12 in.	12x12x12 in.	BRICK Per M. in quantity. Common backing	Straight hard	Per ton, Hydrated finishing	LIME In paper, Common hydrated
Atlanta	$104.00	$114.00	$199.00	$234.00	$244.00	$250.00	$13.50	$18.04	$26.54	$15.04
Baltimore	84.00	90.00	170.00	200.00	260.00	320.00	15.00*k*	19.00*k*	18.00	13.00
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	14.50	17.00	18.11	13.64
Boston	89.35*a*	93.30*a*	178.70*a*	202.50	271.80	308.70	16.50*i*	19.50*i*	17.50†	12.50†
Chicago	72.00	77.00	145.00	197.00	243.00	278.00	12.50	13.50	17.00	15.00
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	22.00	22.00	15.50	13.00
Cleveland	60.00	64.00	120.00	144.00	193.00	221.00	17.00	17.00	15.75*j*	13.25*j*
Dallas	62.50	67.50	135.00	162.00	212.50	263.00	13.50*i*	15.00*i*	19.00	15.00
Denver	84.80	95.40	153.70	178.20	212.00	227.90	14.50	18.00	25.00*j*	17.00*j*
Detroit	86.05	91.80	172.10	213.00	268.00	330.00*e*	20.00	21.00	18.00	16.00
Kansas City	67.00	69.00	89.00*c*	128.00	163.00	189.00	14.50	15.50	19.32	13.00
Los Angeles	73.50†*r*	89.50†*r*	128.00*c*†*r*	210.00†*r*	368.00†*r*	460.00†*r*	13.50	15.00	16.50	17.50
Minneapolis	81.95*b*	87.40*b*	148.70*b*	......	179.30*b*	249.35*b*	13.60	15.60*g*	21.00	16.00
Montreal	99.10*a*	105.65*a*	154.75*a*	101.65*at*	154.75*au*	155.25	24.16†*u*	27.25†*u*	24.60*u*	18.00*u*
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08
New York	78.40	83.60	115.00*c*	193.30*h*	238.80*h*	295.60*h*	16.50/17.50	.....	20.00	14.00
Philadelphia	85.30	91.00	170.50	186.30	235.00	261.10	17.00	20.00	19.00	13.00
Pittsburgh	62.35	66.55	124.75	140.25	173.25	198.00	17.50	19.50	17.90	15.40
St. Louis	67.00	95.00	130.00	190.00	244.00	290.00	18.00	17.00	22.00	18.00
San Francisco	96.00	108.00	144.00	......	......	......	19.00	.....	24.00	23.00
Seattle	115.00	125.00	230.00	......	......	......	20.00*f*	21.00*f*	20.00*s*	20.00*s*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00, ½ cash 15 days, balance 30 days. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* F.o.b. Warehouse only. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., *n* Per sack 100 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *r* 5% discount *s* 2% discount for cash. *t* 5½x8x12. *u* 8% sales tax included.

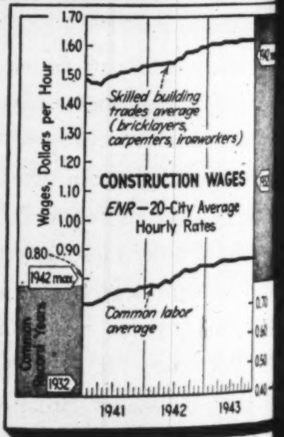
PAINT, ROOFING—F.O.B. CARLOAD LOTS

	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *b*	Ferric Oxide *d*	ROOFING SUPPLIES Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Carload lots f.o.b. factory Asphalt coating per gal.
Atlanta	$10.25	$14.125	$1.30	$2.25	$1.20	$1.90	$1.61	$1.61	$0.27
Baltimore	10.00	13.75	2.00	3.00	2.50	2.30	2.70	2.70	.40
Birmingham	10.25	14.125	2.35	3.50*r*	1.98*r*	2.04	1.97	1.97	.32
Boston	10.00	13.75	1.65	....	2.30	2.10‡	1.65*h*‡	1.65*h*‡	.50‡
Chicago	10.00	13.75	....	....	....	1.75*hf*	1.74*hf*	1.82*hf*	.33*f*
Cincinnati	10.00	13.75	1.70	2.90	1.60	2.40	2.39*h*	2.39*h*	.36
Cleveland	10.00	13.75	2.10	2.90	1.95	1.93	1.83*h*	1.83*h*	.35
Dallas	10.00	14.50	1.88	2.11*n*	.05*l*	1.75*h*	1.66*h*	1.66*h*	.35
Denver	10.50	14.25	1.65	14.25*k*	.27*l*	2.45	3.15	3.15	.35
Detroit	10.00	13.75	1.75	3.00	1.60	2.25	2.25	2.25	.50
Kansas City	10.00	13.875	2.39*g*	2.55*gr*	2.16*g*	2.10	2.30	2.30	.28
Los Angeles	10.25	14.25	1.60	2.25	2.30	2.10	1.50	....	.45
Minneapolis	10.00	13.875	....	....	....	1.75*i*	1.66*hi*	1.66*hi*	.32
Montreal	9.25	6.25	2.50*p*	4.90*p*	3.15*p*	2.67	2.47	2.07	.94
New York	10.00	13.75	2.03	....*r*	1.64	1.66	1.58*h*	1.58*h*	.26
Philadelphia	10.00	13.75	1.60/1.80	2.20*r*	1.55	1.75	1.66	1.66	.32
Pittsburgh	10.00	13.75	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34
St. Louis	10.00	13.75	2.28*s*	2.89*s*	1.96*s*	1.66	1.66	1.66	.28
San Francisco	10.25	14.00	1.80	2.75*n*	1.35	1.71	2.40	2.40	.33
Seattle	10.25	14.25	1.90	3.00	....	2.15	2.16*h*	....	.35

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price charges. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266-31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per *l* Per lb. *m* Per bbl. *n* May, 1941 price, no later quotation available 8% sales tax. *r* Not available, except on priority rating; then quoted *s* December, 1942 price.

SKILLED AND COMMON WAGE RATES—PER HOUR

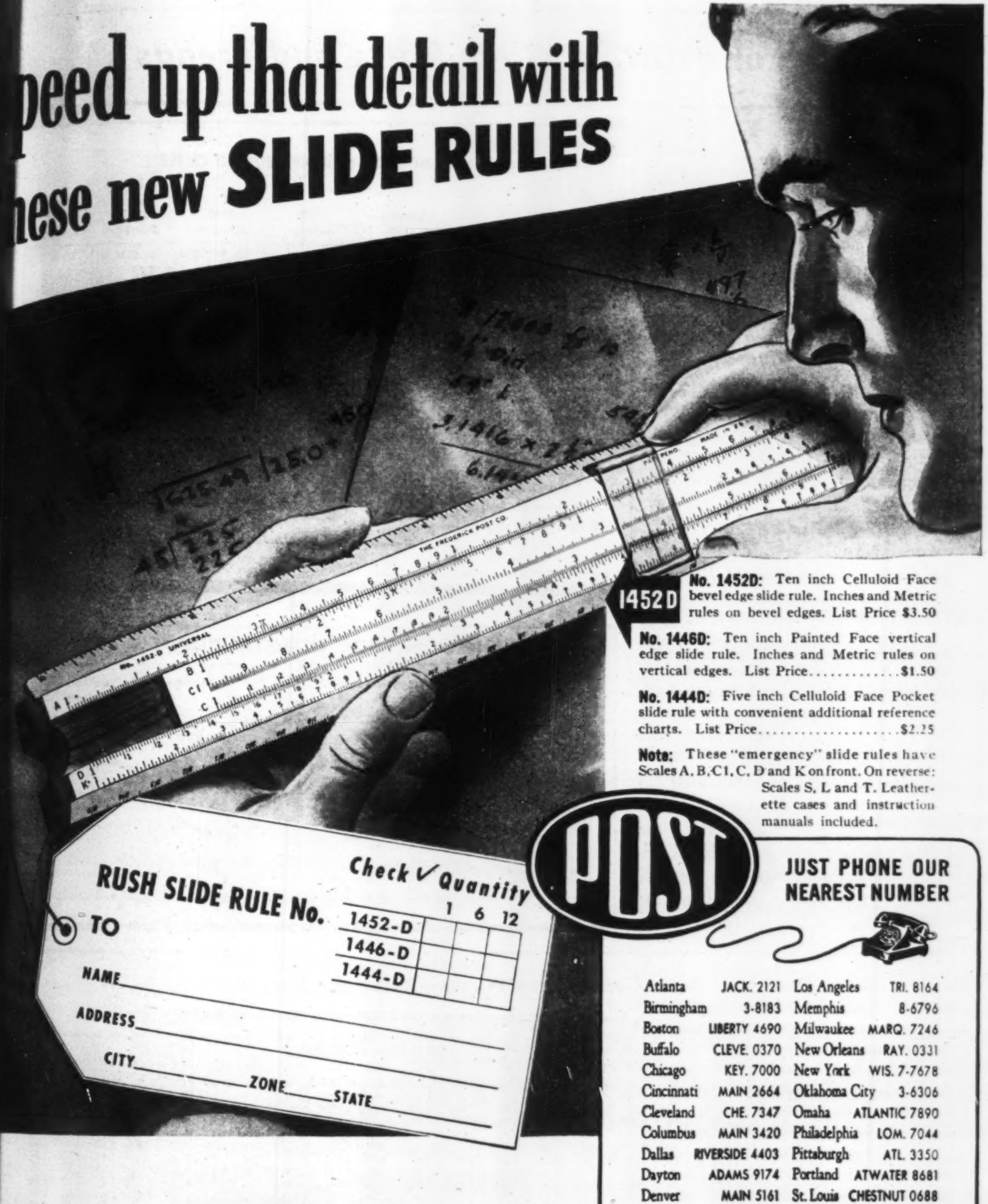
	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.50	$1.25	$1.50	$1.25	$1.50	$0.40	$0.50
Baltimore	1.75	1.375	1.80	1.625/1.80	1.50	.75	.75
Birmingham	1.75	1.25	1.50	1.25/1.50	1.50	.65	.65
Boston	1.625	1.50	1.65	1.875	1.667	.80/1.00	.80/1.00
Chicago	1.75	1.70	1.76	1.75	1.825	1.10	1.10
Cincinnati	1.75	1.50	1.675	1.45/1.60	1.625	.85	.85
Cleveland	1.875*c*	1.55	1.75	1.75	1.75	1.00/1.25	1.00/1.25
Dallas	1.625	1.25	1.50	1.75	1.625	.60	.75/1.25
Denver	1.65*b*	1.50*b*	1.50*b*	1.50*b*	1.65*b*	.80*b*	.80*b*
Detroit	1.675	1.50	1.75	1.625/1.75	1.675	.90	.90
Kansas City	1.65	1.50	1.625	1.625	1.65	.90	.90
Los Angeles	1.50	1.35	1.625	1.375	1.667	.875	.875
Minneapolis	1.50	1.375	1.50	1.40	1.50*e*	.925	.925
New Orleans	1.50	1.25	1.50	1.50	1.375	.65	.75
New York	2.00*b*	1.85*b*	2.00	2.00*b*	2.00*b*	1.031	.95
Philadelphia	1.90	1.50	1.90	2.00	2.00	.825	.825
Pittsburgh	1.90	1.75	1.75	1.8125	1.875	.90	.80
St. Louis	1.75	1.50	1.75	2.00	1.75	.95	.95
San Francisco	1.875	1.50	1.75	1.50/1.75	1.75	.95	.95
Seattle	1.78	1.48	1.68	2.00	1.78	1.08	1.10
Montreal*f*	.92	.81	.90	.76	.90	.46	.53



ENR Skilled Average; (Bricklayers, Carpenters, Ironworkers)
ENR Common Average; $0.869

b 7 hr. day. *c* Prevailing rate on government work. *e* 30 hr. wk. *f* Effective Nov. 15, 35c weekly bonus added to these rates.

peed up that detail with hese new SLIDE RULES



No. 1452D: Ten inch Celluloid Face bevel edge slide rule. Inches and Metric rules on bevel edges. List Price $3.50

No. 1446D: Ten inch Painted Face vertical edge slide rule. Inches and Metric rules on vertical edges. List Price.............$1.50

No. 1444D: Five inch Celluloid Face Pocket slide rule with convenient additional reference charts. List Price....................$2.25

Note: These "emergency" slide rules have Scales A, B, C1, C, D and K on front. On reverse: Scales S, L and T. Leatherette cases and instruction manuals included.

RUSH SLIDE RULE No.

Check ✓ Quantity

	1	6	12
1452-D			
1446-D			
1444-D			

TO

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ADDRESS__________

CITY__________ ZONE_____ STATE__________

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JUST PHONE OUR NEAREST NUMBER

Atlanta	JACK. 2121	Los Angeles	TRI. 8164
Birmingham	3-8183	Memphis	8-6796
Boston	LIBERTY 4690	Milwaukee	MARQ. 7246
Buffalo	CLEVE. 0370	New Orleans	RAY. 0331
Chicago	KEY. 7000	New York	WIS. 7-7678
Cincinnati	MAIN 2664	Oklahoma City	3-6306
Cleveland	CHE. 7347	Omaha	ATLANTIC 7890
Columbus	MAIN 3420	Philadelphia	LOM. 7044
Dallas	RIVERSIDE 4403	Pittsburgh	ATL. 3350
Dayton	ADAMS 9174	Portland	ATWATER 8681
Denver	MAIN 5161	St. Louis	CHESTNUT 0688
Detroit	RAN. 8483	Salt Lake City	4-7823
Ft. Wayne	ANT'Y 4142	San Diego	FRANKLIN 1344
Fort Worth	3-3244	San Francisco	DOU. 5975
Hollywd	GRANITE 4188	Seattle	MAIN 4022
Houston	CAPITOL 1233	Tampa	M-8377
Indianapolis	MKT. 4468	Toledo	ADAMS 7224
Jacksonville	5-2166	Tulsa	3-0168
Kans. City	VICTR 7881	Washington	NATL. 4063
Knoxville	3-4944	Wichita	2-2722

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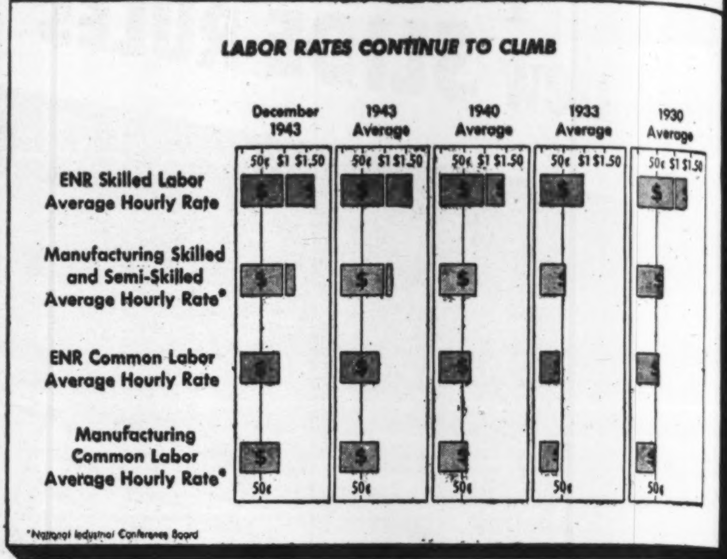
Construction Wage Rates and Trends

Common labor hourly rates for construction workers averaged 85.8c. in 1943, a new all-time high, and 6.7 percent above the 1942 *ENR* 20-cities' average rate. This average rate opened the year at 83.2c. and by August had reached 86.9c., where it remained for the balance of the year.

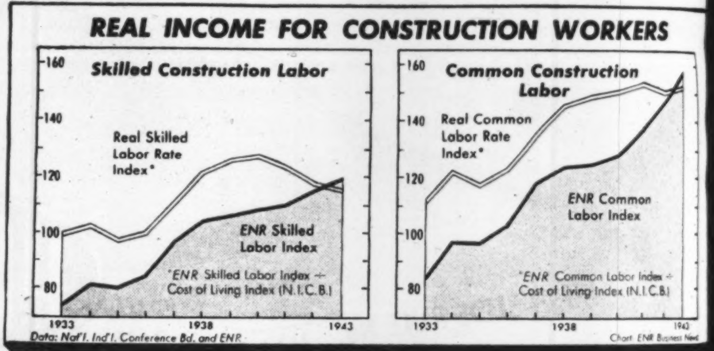
The skilled construction hourly rate average for the twenty cities was $1.606 in January, 1943; climbed to $1.622 in August and September; and then settled to $1.620 in October where it remained in November and December. The December value was 0.9 percent above that reported for January, 1943. The 1943 average, $1.615, rose 3.3 percent over 1942.

Bricklayers' 1943 hourly rate averaged $1.707; carpenters', $1.467; and structural ironworkers', $1.671. All averages attained new highs in topping their previous records of 1942.

Real income for skilled construction workers, that is, hourly rates adjusted for increased living costs, declined for the second successive year. Although skilled construction workers' average hourly rate increased 3.3 percent over the 1942 average, living costs rose 5.6 percent, offsetting the skilled workers' rate gain. The common labor average, however, rose 6.7 percent, at a faster pace than the N.I.C.B. Cost of Living Index.



*National Industrial Conference Board



Data: Nat'l. Ind'l. Conference Bd. and ENR

Chart: ENR Business News

Construction Wages—Rates per Hour

20-CITIES AVERAGE REPORTED BY ENGINEERING NEWS-RECORD

CONSTRUCTION WAGES

	Skilled Aver.†	Common
1910	$0.525	$0.179
1911	.534	.179
1912	.542	.182
1913	.555	.19
1914	.565	.177
1915	.57	.182
1916	.58	.192
1917	.61	.281
1918	.68	.38
1919	.78	.466
1920	1.05	.579
1921	1.06	.54
1922	1.01	.442
1923	1.10	.518
1924	1.19	.555

Notes:

†*ENR* Skilled Average represents rates for bricklayers, carpenters, ironworkers.

(1) Skilled and Semi-killed.

(2) Unskilled.

Both represent earnings per hour as reported by N. I. C. B.

*Checked monthly Reported in first issue of *ENR* each month.

SKILLED LABOR †*

	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
J	$1.21	$1.24	$1.28	$1.34	$1.35	$1.37	$1.37	$1.15	$0.989	$1.054
F	1.21	1.24	1.32	1.34	1.35	1.38	1.37	1.11	.996	1.062
M	1.21	1.24	1.32	1.34	1.35	1.38	1.36	1.11	.991	1.069
A	1.22	1.25	1.30	1.35	1.35	1.38	1.36	.95	.997	1.084
M	1.22	1.26	1.31	1.36	1.35	1.38	1.36	.96	.998	1.101
J	1.23	1.27	1.33	1.35	1.36	1.38	1.32	.99	.994	1.101
J	1.22	1.27	1.33	1.35	1.36	1.38	1.23	1.00	.985	1.104
A	1.23	1.28	1.34	1.35	1.37	1.39	1.19	.98	.986	1.110
S	1.23	1.28	1.34	1.35	1.37	1.39	1.19	.99	1.016	1.119
O	1.23	1.29	1.33	1.35	1.37	1.39	1.17	.98	1.029	1.120
N	1.23	1.29	1.34	1.35	1.37	1.39	1.16	.97	1.037	1,120
D	1.24	1.29	1.33	1.35	1.37	1.39	1.15	.98	1.062	1.120
Aver.	**1.22**	**1.27**	**1.32**	**1.35**	**1.36**	**1.38**	**1.27**	**1.02**	**1.006**	**1.097**
Mfg.(1)	.644	.651	.656	.659	.668	.662	.634	.559	.55	.642

	1935	1936	1937	1938	1939	1940	1941	1942	1943
J	$1.108	$1.119	$1.22	$1.39	$1.43	$1.47	$1.47	$1.53	$1.61
F	1.104	1.119	1.24	1.39	1.43	1.47	1.47	1.54	1.61
M	1.092	1.132	1.25	1.40	1.43	1.47	1.47	1.54	1.61
A	1.093	1.134	1.26	1.40	1.44	1.47	1.48	1.54	1.61
M	1.081	1.138	1.30	1.40	1.44	1.47	1.49	1.54	1.61
J	1.074	1.138	1.33	1.41	1.44	1.47	1.49	1.55	1.61
J	1.077	1.159	1.35	1.43	1.44	1.48	1.50	1.56	1.62
A	1.088	1.159	1.37	1.43	1.44	1.48	1.50	1.59	1.62
S	1.088	1.159	1.37	1.43	1.44	1.48	1.52	1.59	1.62
O	1.104	1.176	1.38	1.43	1.44	1.48	1.52	1.59	1.62
N	1.101	1.178	1.38	1.43	1.46	1.48	1.52	1.60	1.62
D	1.101	1.180	1.39	1.43	1.46	1.48	1.52	1.60	1.62
Aver.	**1.093**	**1.149**	**1.32**	**1.41**	**1.44**	**1.47**	**1.50**	**1.56**	1.615
Mfg.(1)	.662	.685	.78	.80	.81	.83	.916	1.044	1.163

COMMON LABOR *

	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
J	$0.55¼	$0.54	$0.55¾	$0.55	$0.559	$0.5628	$0.5384	$0.4524	$0.4271	$0.5158
F	.54	.54	.55¾	.54¾	.564	.5628	.5428	.4521	.4285	.5268
M	.54¼	.54¼	.56	.54¾	.5509	.5610	.5371	.4358	.4272	.5268
A	.54¼	.54¼	.56	.55	.529	.5646	.5359	.4122	.4343	.5343
M	.54	.55	.55½	.55	.5315	.5628	.5394	.4105	.4442	.5343
J	.53	.55	.55½	.55½	.534	.5628	.5394	.4121	.4393	.5343
J	.53	.55¼	.55½	.55¼	.5296	.5615	.4721	.4114	.4430	.5300
A	.53	.55½	.55½	.5607	.5353	.5615	.4634	.4220	.4430	.5300
S	.53	.55½	.55½	.5607	.5496	.5609	.4665	.4308	.4524	.5349
O	.54	.55	.54½	.5628	.5496	.5596	.4584	.4308	.5057	.5363
N	.54	.55½	.54½	.5653	.5603	.5587	.4559	.4260	.5102	.5388
D	.54	.55½	.55	.5628	.5653	.5503	.4534	.4273	.5202	.5413
Aver.	**.538**	**.548**	**.554**	**.5558**	**.5465**	**.5607**	**.5002**	**.4269**	**.4562**	**.5319**
Mfg. (2)	.455	.461	.472	.474	.486	.478	.461	.401	.401	.478

	1935	1936	1937	1938	1939	1940	1941	1942	1943
J	$0.5376	$0.547	$0.603	$0.680	$0.682	$0.685	$0.711	$0.776	$0.832
F	.5241	.547	.603	.675	.680	.685	.713	.780	.832
M	.5243	.547	.612	.675	.680	.685	.716	.780	.842
A	.5255	.552	.612	.677	.683	.685	.725	.788	.856
M	.5233	.558	.627	.673	.682	.690	.741	.788	.863
J	.5269	.564	.644	.677	.684	.703	.747	.796	.863
J	.5289	.563	.662	.677	.684	.707	.753	.803	.863
A	.5285	.569	.668	.677	.685	.707	.753	.823	.869
S	.5285	.569	.673	.677	.685	.711	.761	.823	.869
O	.5285	.583	.676	.682	.685	.711	.761	.826	.869
N	.5275	.583	.678	.682	.685	711	.768	.832	.869
D	.5275	.586	.678	.682	.685	.711	.769	.832	.869
Aver.	**.5276**	**.564**	**.645**	**.678**	**.683**	**.699**	.743	**.804**	**.858**
Mfg. (2)	.494	.498	.568	.584	.594	.61	.682	.774	.834

Listen, wire rope users....

AMERICAN TIGER BRAND WIRE ROPE
AMERICAN STEEL & WIRE COMPANY

HAVE YOU TRIED TO GET TIGER BRAND... LATELY?

When America was plunged into war, we were asked to put practically our entire wire rope production at the service of Uncle Sam. For good wire rope, in enormous quantities, was urgently required for military use.

As a result, we have had to disappoint some of our customers. They were prompt to realize that it was not only a case of military necessity but to their ultimate advantage to stand aside for the time being. We are grateful for their cooperation.

Although enormous tonnages of Tiger Brand are still going to our fighting men and to our Allies, a steadily growing quantity is being made available for use here at home. So, when you need good wire rope, give us a call. The chances are becoming increasingly better that we may be able to supply you with your old favorite, American Tiger Brand—today even a better product because of its war service.

Excellay Preformed

AMERICAN STEEL & WIRE COMPANY
Cleveland, Chicago and New York
COLUMBIA STEEL COMPANY
San Francisco
United States Steel Export Company, New York

USS

UNITED STATES STEEL

Wage Rates per Hour
New York City

	Carpenters, 10 Hr. Day	Bricklayers, 8 Hr. Day	Masons' Laborers, 8 Hr. Day	Common Laborers, 10 Hr. Day	Structural Iron-Workers
1874	$0.23	$0.43	$0.18	$0.14	......
1875	.22½	.37	.18	.14	......
1876	.21	.31	.17	.14	......
1877	.20	.31	.15	.12	......
1878	.18	.31	.15	.11	......
1879	.17	.31	.16	.11	......
1880	.18	.34	.18	.12	......
1881	.19	.46	.21	.13	......
1882	.21	.50	.22	.15	......
1883	.21	.50	.23	.13	......
1884	.21	.50	.22	.13	......
1885	.20	.50	.22	.13	......
1886	.21	.50	.23	.13	......
1887	.21	.50	.20	.14	......
1888	.22	.50	.16	.12	......
1889	.22	.50	.23	.13	......
	8 Hr. Day			9 Hr. Day	
1890	.43	.47	.28	.14	......
1891	.43	.47	.28	.14	......
1892	.44	.50	.29	.14	......
1893	.43	.50	.30	.14	......
1894	.44	.50	.30	.14	......
1895	.43	.50	.30	.14	......
1896	.44	.50	.30	.14	......
1897	.44	.50	.29	.14	......
1898	.44	.50	.30	.14	......
1899	.45	.55	.33	.14	......
1900	.50	.56	.33	.14	......
1901	.50	.59	.33	.19	......
1902	.51	.65	.36	.17	......
1903	.56	.65	.36	.16	......
1904	.53	.65	.36	.19	......
1905	.54	.70	.36	.20	......
1906	.58	.70	.38	.21	......
				—8 Hr. Day—	
1907	.62½	.70	.37½	.22	$0.60
1908	.62½	.70	.37½	.22	.60
1909	.62½	.70	.37½	.22	.60
1910	.62½	.70	.37½	.22	.62½
1911	.62½	.70	.37½	.22	.62½
1912	.62½	.70	.37½	.23	.62½
1913	.62½	.70	.37½	.22½	.62½
1914	.62½	.75	.37½	.22½	.62½
1915	.62½	.75	.37½	.25	.62½
1916	.62½	.75	.37½	.25	.66
1917	.69	.75	.42½	.30	.68
1918	.69	.81	.47	.40½	.80
1919	.75	.87½	.57½	.40½	.87½
1920	1.12½	1.25	.77½	.75	1.12½
1921	1.12½	1.25	.87½	.60	1.12½
1922	1.12½	1.25	.87½	.60	1.12½
1923	1.12½	1.50	.95	.61¼	1.12½
1924	1.31¼	1.50	1.00	.68¾	1.29
1925	1.31¼	1.50	1.00	.65⅝	1.46¾
1926	1.45	1.64½	1.07	.81¼	1.60
1927	1.50	1.75	1.12½	.90⅝	1.75
1928	1.50	1.75	1.12½	.90⅝	1.75
1929	1.55	1.84	1.15	.98⅜	1.81
1930	1.65	1.92½	1.03⅛	1.03⅛	1.92½
1931	1.45	1.71¾	1.02½	.65⅝	1.92½
1932	1.33	1.47	1.00	.64⅜	1.67½
1933	1.37½	1.57½	.91	.72¼	1.65
1934	1.40	1.53	.82½	.84¾	1.62
1935	1.40	1.50	.82½	.68	1.65
1936	1.40	1.50	.82½	.65	1.58
1937	1.60	1.73	.91	.76	1.79
	—7 Hr. Day—				
1938	1.75	1.88½	.99⅜	.91¼	1.92½
1939	1.75	1.89¾	1.03⅛	.91¼	1.92½
1940	1.81	1.96	1.03⅛	.91¼	1.96⅞
1941	1.85	2.00	1.03⅛	.93 1/16	2.00
1942	1.85	2.00	1.03⅛	.95	2.00
1943	1.85	2.00	1.03⅛	.95	2.00
		1942 by months			
Jan.	1.85	2.00	1.03⅛	.95	2.00
Feb.	1.85	2.00	1.03⅛	.95	2.00
Mar.	1.85	2.00	1.03⅛	.95	2.00
Apr.	1.85	2.00	1.03⅛	.95	2.00
May	1.85	2.00	1.03⅛	.95	2.00
June	1.85	2.00	1.03⅛	.95	2.00
July	1.85	2.00	1.03⅛	.95	2.00
Aug.	1.85	2.00	1.03⅛	.95	2.00
Sept.	1.85	2.00	1.03⅛	.95	2.00
Oct.	1.85	2.00	1.03⅛	.95	2.00
Nov.	1.85	2.00	1.03⅛	.95	2.00
Dec.	1.85	2.00	1.03⅛	.95	2.00
		1943 by months			
Jan.	1.85	2.00	1.03⅛	.95	2.00
Feb.	1.85	2.00	1.03⅛	.95	2.00
Mar.	1.85	2.00	1.03⅛	.95	2.00
Apr.	1.85	2.00	1.03⅛	.95	2.00
May	1.85	2.00	1.03⅛	.95	2.00
June	1.85	2.00	1.03⅛	.95	2.00
July	1.85	2.00	1.03⅛	.95	2.00
Aug.	1.85	2.00	1.03⅛	.95	2.00
Sept.	1.85	2.00	1.03⅛	.95	2.00
Oct.	1.85	2.00	1.03⅛	.95	2.00
Nov.	1.85	2.00	1.03⅛	.95	2.00
Dec.	1.85	2.00	1.03⅛	.95	2.00
		1944 by months			
Jan.	1.85	2.00	1.03⅛	.95	2.00
Feb.	1.85	2.00	1.03⅛	.95	2.00
Mar.	1.85	2.00	1.10	.95	2.00
Apr.	1.85	2.00	1.10	.95	2.00

Index of Union Hourly Wage Rates in Building Trades
1929 = 100

Industrial Relations Division
U. S. Department of Labor, Bureau of Labor Statistics

Year	All Building Trades	Journeymen	Helpers & Laborers	Bricklayers	Carpenters	Cement Finishers	Electricians (Inside Wiring)	Glaziers	Lathers	Painters	Plasterers	Plumbers & Gas Fitters	Sheet-Metal Workers	Steam & Sprinkler Fitters	Stonemasons	Structural Ironworkers	Building Laborers
1933	86.8	86.9	85.2	85.2	85.2	91.2	89.9	88.0	89.7	87.8	83.7	90.6	89.4	88.2	84.5	91.3	[illegible]
1934	87.4	87.4	87.7	84.5	86.7	92.1	90.1	93.2	92.1	86.4	84.6	91.4	89.7	89.2	84.4	92.5	[illegible]
1935	88.4	88.4	88.2	84.2	87.8	92.6	94.4	94.1	93.1	86.7	85.6	92.8	90.4	90.7	84.2	93.2	[illegible]
1936	91.6	91.3	93.4	84.7	92.3	95.0	96.9	95.5	95.5	91.1	86.1	95.2	92.2	93.7	85.2	95.6	[illegible]
1937	98.0	97.6	101.5	90.6	98.3	101.9	101.1	104.6	101.8	97.7	94.9	100.4	98.9	98.8	94.1	104.4	[illegible]
1938	106.7	106.1	111.7	100.1	107.1	111.3	111.4	112.2	112.7	104.2	106.1	112.5	108.8	111.4	102.1	112.7	[illegible]
1939	107.4	106.8	112.6	100.6	107.3	111.7	112.0	113.0	116.4	105.0	107.0	113.5	110.4	112.2	102.4	114.0	[illegible]
1940	109.1	108.3	114.8	102.8	110.0	112.7	113.9	114.3	117.2	105.2	107.5	115.3	112.4	112.5	101.9	114.4	[illegible]
1941	113.1	112.1	120.3	105.2	112.5	116.7	119.1	117.9	121.6	112.2	109.4	120.3	117.6	116.0	104.5	119.9	[illegible]
1942	120.2	118.4	132.3	109.0	120.3	123.8	127.1	122.9	127.0	116.0	112.4	125.4	128.1	122.6	110.6	123.9	[illegible]
1943	121.0	119.1	133.9	109.4	120.7	125.1	127.4	123.8	127.1	118.0	112.6	125.9	128.5	123.3	111.0	124.4	[illegible]

Index of Weekly Hours in Union Building Trades
1929 = 100

Year	All Building Trades	Journeymen	Helpers & Laborers	Bricklayers	Carpenters	Cement Finishers	Electricians (Inside Wiring)	Glaziers	Lathers	Painters	Plasterers	Plumbers & Gas Fitters	Sheet-Metal Workers	Steam & Sprinkler Fitters	Stonemasons	Structural Ironworkers	Building Laborers
1933	94.0	93.8	94.4	94.9	91.6	95.7	94.3	92.9	92.9	97.7	97.2	93.3	93.2	93.1	93.8	93.1	[illegible]
1934	90.5	90.3	91.4	93.3	90.8	92.2	88.7	88.1	87.5	85.6	93.1	92.4	91.9	92.5	93.4	91.8	[illegible]
1935	89.8	89.6	90.8	93.2	90.4	92.0	85.1	87.5	87.4	85.5	91.6	91.8	92.0	92.2	93.3	90.7	[illegible]
1936	89.8	89.6	91.0	93.2	90.5	91.6	85.4	87.8	86.5	85.9	90.1	90.6	91.9	92.4	93.3	90.6	[illegible]
1937	90.2	90.0	91.3	94.1	90.3	91.7	89.6	87.9	87.7	85.9	90.2	91.1	92.0	92.5	93.3	90.2	[illegible]
1938	88.7	88.4	89.9	91.0	88.6	88.9	89.1	86.3	86.1	86.0	86.5	86.5	90.1	87.6	90.2	89.2	[illegible]
1939	88.5	88.3	89.7	91.1	88.6	88.9	88.8	86.1	85.4	85.7	86.5	86.8	90.1	88.0	90.2	89.1	[illegible]
1940	88.4	88.3	89.2	90.8	88.6	89.1	88.8	86.1	85.2	86.1	86.3	85.9	90.1	88.0	90.1	89.1	[illegible]
1941	88.8	88.7	89.4	91.0	89.1	89.5	89.3	86.6	86.0	86.3	86.6	86.3	90.8	88.5	90.2	89.5	[illegible]
1942	89.5	89.9	88.6	91.8	89.3	89.4	92.9	87.8	87.5	91.3	88.2	86.7	90.9	89.9	90.4	90.1	[illegible]
1943	89.4	90.1	88.0	91.8	89.3	89.4	92.9	87.8	88.3	91.3	91.7	88.4	90.9	89.9	90.4	90.1	[illegible]

Overtime Rates Provided in Building-Trades Union Agreement
July 1, 1943

Trade	Number of quotations showing initial overtime rates of—			Number of quotations show Sunday rates of—		
	Time and a half	Double time	No penalty rate specified	Time and a half	Double time	No penal rate specif
All building trades	1,718	1,081	3	883	1,916	[illegible]
Journeymen	1,272	908	2	682	1,498	[illegible]
Asbestos workers	38	33	....	26	44	[illegible]
Boilermakers	14	33	....	7	40	[illegible]
Bricklayers	47	42	....	23	66	[illegible]
Carpenters	82	44	....	39	87	[illegible]
Cement finishers	68	22	....	44	46	[illegible]
Electricians, inside wiremen	53	40	....	33	60	[illegible]
Elevator constructors	48	78	....	10	116	[illegible]
Glaziers	59	17	....	29	47	[illegible]
Granite cutters	10	5	....	1	14	[illegible]
Lathers	35	44	....	20	59	[illegible]
Machinists	25	14	....	13	26	[illegible]
Marble setters	31	35	....	12	54	[illegible]
Mosaic and terrazzo workers	39	18	....	14	43	[illegible]
Painters	115	40	....	99	86	[illegible]
Paperhangers	60	14	....	36	38	[illegible]
Plasterers	44	47	....	33	58	[illegible]
Plumbers and gas fitters	41	43	....	24	60	[illegible]
Rodmen	21	52	....	16	57	[illegible]
Roofers, composition	89	23	....	41	71	[illegible]
Roofers, slate and tile	49	16	....	25	40	[illegible]
Sheet-metal workers	24	50	....	16	58	[illegible]
Sign painters	68	10	....	28	50	[illegible]
Steam and sprinkler fitters	56	57	....	32	81	[illegible]
Stonecutters	20	6	2	10	17	[illegible]
Stonemasons	34	26	....	15	45	[illegible]
Structural-iron workers	24	70	....	19	75	[illegible]
Tile layers	48	29	....	17	60	[illegible]
Helpers and laborers	446	173	1	201	418	[illegible]
Bricklayers' tenders	88	11	....	43	56	[illegible]
Building laborers	81	11	....	41	51	[illegible]
Composition roofers' helpers	25	4	....	13	16	[illegible]
Elevator constructors' helpers	27	61	....	7	81	[illegible]
Marble setters' helpers	24	12	....	5	31	[illegible]
Plasterers' laborers	69	18	....	37	50	[illegible]
Plumbers' laborers	36	10	....	21	25	[illegible]
Steam and sprinkler fitters' helpers	23	21	1	11	33	[illegible]
Terrazzo workers' helpers	37	13	....	13	37	[illegible]
Tile layers' helpers	36	12	....	10	38	[illegible]

Building Trades Wage Rates

(Prevailing March 1, 1944. Compiled by Engineering News-Record)

and State	Carpenters	Bricklayers	Structural Ironworkers	Common Labor—Buildings	Common Labor—Hvy. Constr.	Stone Masons	Mason's Helpers	Plasterers	Mosaic and Terrazzo	Tile Layers	Cement Finishers	Lathers	Electric Workers (Inside)	Painters	Glaziers	Plumbers	Steamfitters	Roofers	Waterproofers	Sheet Metal Workers	Welders	Hoisting Engr.—1-Drum	Hoisting Engr.—2-Drum	Tractor Operator (Over 30-hp.)	Power Shovel Operator	Truck Drivers (Over 1½ Tons)
, Ga.	$1.25	$1.50	$1.50	$0.50	$0.40	.....	.....	$1.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	$1.25	.....	.....	.....	.....
, Md.	1.38	1.75	1.80	.75	.75	$1.75	$0.95	1.50	$1.50	$1.50	$1.50	$1.50	$1.65	$1.30	$1.44	$1.65	$1.65	$1.38	$1.38	$1.58	†	1.63	$2.00	$1.50	$2.00	$0.75
uge, La.	1.25	1.63	1.50	.50	.50	1.63	.70	1.50	1.50	1.63	1.50	1.50	1.50	1.38	1.50	1.50	1.50	1.13	1.00	1.25	1.50	1.25	1.50	1.25	1.50	.75
am, Ala.	1.25	1.75	1.50	.55	.65	1.75	.65	1.50	1.75	1.75	1.50	1.25	1.65	1.38	1.38	1.75	1.75	.....	.....	1.40	†	1.25	1.50	1.25	1.50	1.00
, N. D.	1.00	1.40	1.15	.75	.75	1.40	.75	1.25	.....	1.40	1.00	1.00	1.00	1.15	1.15	1.25	.....	.....	.90	1.35	1.35	1.25	1.35	1.35	1.35	.75
aho.	1.25	1.50	1.50	.75	1.00	.....	.....	1.50	.....	.....	1.25	1.38	1.50	1.13	1.13	1.50	1.50	1.25	.....	1.25	1.45	1.25	1.45	1.45	[a]1.75	1.00
Mass.	1.50	1.63	1.65	1.00	1.00	1.63	1.00	1.67	1.63	1.63	1.63	1.67	1.65	1.44	1.50	1.65	1.65	1.50	1.63	1.65	†	1.88	1.88	1.70	1.88	.98
N. Y.	1.50	1.75	1.75	1.00	1.00	1.50	.....	1.75	1.38	1.38	1.50	1.75	1.75	1.75	1.50	1.75	1.75	1.45	1.45	1.60	1.75	1.59	1.59	1.25	1.75	.90
n, Vt.	1.00	1.50	1.50	.60	.75	1.50	.75	1.50	.....	1.50	1.00	1.75	1.00	.80	1.00	1.25	1.25	1.25	1.25	1.50	1.00	1.00	1.00	1.00	1.00	[b].75
n, S. C.	1.13	1.50	.....	.50	.50	1.50	.60	1.25	1.50	1.50	1.00	1.00	1.50	1.13	.85	1.75	1.75	1.00	1.00	1.00	1.14	1.00	1.25	1.00	1.50	.60
n, W. Va.	1.50	1.75	1.63	.75	.90	1.75	.90	1.50	1.50	1.75	1.25	1.38	1.63	1.25	1.25	1.50	1.63	1.25	1.25	1.63	.....	1.63	1.63	1.38	1.68	.83
, N. C.	1.00	1.10	1.50	.50	.75	1.25	.50	1.25	1.25	1.25	1.00	1.38	1.25	1.15	1.00	1.50	1.50	1.00	.90	1.00	1.00	1.05	1.25	.75	1.25	.75
, Wyo.	1.29	1.65	1.50	.80	.80	1.65	1.10	1.50	1.29	1.29	1.44	1.50	1.44	1.29	1.29	1.38	1.38	1.29	.....	1.44	.....	1.15	1.44	1.44	1.73	.86
Ill.	1.70	1.75	1.76	1.10	1.10	1.75	.....	1.83	1.70	1.70	1.70	1.83	1.70	1.73	1.88	1.70	1.70	1.75	1.75	1.75	1.76	1.75	1.75	1.48	2.00	1.05
ti, Ohio	1.50	1.75	1.68	.85	.85	1.75	1.05	1.63	1.50	1.50	1.45	1.63	1.73	1.55	1.75	1.65	1.65	1.63	1.63	1.55	†	1.45	1.60	1.38	1.60	.80
d, Ohio	1.58	1.88	1.88	1.04	1.15	1.88	1.04	1.88	1.58	1.58	1.58	1.88	1.75	1.58	1.63	1.73	1.73	1.63	1.58	1.58	1.88	1.88	1.88	1.25	1.88	1.00
, S. C.	1.00	1.25	.....	.40	.40	1.25	.40	1.00	.....	.....	1.25	.....	.....	1.00	.....	1.25	.....	.....	.....	.....	.....	.....	.....	1.00	1.25	.50
, Ohio	1.38	1.75	1.63	.75	.75	1.75	.95	1.65	1.25	1.25	1.38	1.55	1.50	1.38	1.25	1.58	1.58	1.38	1.38	1.50	1.63	1.38	1.63	1.15	1.63	.80
Ark.	1.25	1.50	.....	.40	.60	1.50	.60	1.50	.....	.....	1.50	1.50	1.38	1.00	.....	1.50	1.50	1.00	.....	.....	.....	.....	.....	.....	.....	.....
Tex.	1.25	1.70	1.50	.75	.70	1.70	.75	1.63	1.50	1.50	1.50	1.63	1.63	1.25	1.13	1.63	1.63	1.00	1.00	1.50	1.63	1.38	1.38	1.38	1.50	.80
es, Iowa	1.38	1.63	1.50	.80	.80	1.60	.80	1.50	1.25	1.25	1.38	1.43	1.50	1.32	1.13	1.55	1.55	1.15	1.15	1.50	†	1.40	1.50	1.50	1.50	.85
Colo.	1.50	1.65	1.50	.80	.80	1.65	1.10	[c]1.50	1.50	1.50	1.50	1.50	1.50	1.43	1.30	1.50	1.50	1.50	1.50	1.50	†	1.50	1.63	1.50	1.63	1.00
Mich.	1.50	1.73	1.75	.90	.75	1.50	.90	1.73	1.50	1.73	1.50	1.68	1.85	1.50	1.44	1.75	1.75	1.90	1.50	1.55	†	1.68	1.75	1.68	1.68	1.00
Minn.	1.28	1.38	1.50	.78	.88	1.38	.78	1.35	1.38	1.00	1.25	1.35	1.40	1.13	.95	1.38	1.38	1.20	.....	1.30	1.50	1.50	1.50	1.20	1.63	1.00
rth, Tex.	1.25	1.50	1.38	.60	.70	1.25	.70	1.63	1.38	1.63	1.25	1.50	1.00	1.13	1.50	1.50	1.50	1.38	1.38	1.50	.90	1.38	1.38	1.25	1.38	.70
rg, Pa.	1.50	1.63	2.00	.85	.85	1.63	1.05	1.50	1.50	1.40	1.50	1.38	1.50	1.25	1.25	1.40	1.40	1.40	1.40	1.25	1.75	1.90	.....	1.38	1.93	.75
, Tex.	1.38	1.73	1.63	.....	.....	1.73	.75	1.63	1.50	1.50	1.50	1.63	1.63	1.25	1.25	1.63	1.63	1.50	.....	1.63	†	1.25	1.50	1.50	1.50	.75
polis, Ind.	1.43	1.68	1.65	.83	.85	1.68	1.10	1.63	1.38	1.50	1.38	1.50	1.63	1.43	1.10	1.63	1.63	1.33	1.18	1.47	1.50	1.30	1.60	1.00	1.60	.85
, Miss.	1.25	1.50	2.00	.50	.55	1.50	.55	1.50	1.25	1.25	1.50	1.25	1.38	1.13	1.00	1.50	1.50	1.25	.....	1.25	1.25	1.13	1.38	1.25	1.38	.60
wn, N. Y.	1.30	1.75	1.63	.85	1.00	1.75	.85	1.63	1.38	1.38	1.50	1.75	1.40	1.10	1.50	1.50	1.50	1.40	.....	1.25	1.63	1.59	1.59	1.25	1.75	1.00
City, Mo.	1.13	1.50	1.75	.75	.75	1.50	1.00	1.75	1.50	1.50	1.75	1.13	1.50	1.00	1.00	1.50	1.50	1.25	1.75	1.25	1.50	1.50	2.00	2.00	2.00	.95
City, Mo.	1.50	1.65	1.63	.90	.90	1.40	1.05	1.65	1.45	1.45	1.50	1.58	1.65	1.38	1.56	1.65	1.65	1.38	1.38	1.63	.95	1.50	1.63	1.13	1.38	.83
, Mich.	1.40	1.75	1.75	.85	.85	.....	.....	1.65	1.25	.....	1.38	1.50	1.50	1.38	1.25	1.50	1.50	1.25	.....	1.25	.....	1.63	.....	.....	1.63	.80
on, Ky.	1.25	1.50	1.50	.75	.75	1.50	.90	1.50	1.50	1.50	1.38	1.50	1.50	1.10	1.25	1.63	1.63	1.05	1.05	1.43	†	1.50	1.50	1.25	1.50	.90
geles, Calif.	1.35	1.50	1.63	.88	1.13	1.50	1.13	1.67	1.44	1.44	1.50	1.67	1.70	1.25	1.25	1.50	1.75	1.25	1.38	1.50	†	1.38	1.38	1.50	1.75	1.00
Rock, Ark.	1.25	1.25	1.50	.50	.60	1.50	.75	1.50	1.50	1.50	1.25	1.25	1.38	1.25	1.25	1.50	1.50	1.25	1.25	1.50	1.50	1.25	1.38	1.25	1.38	1.38
, Miss.	1.25	1.50	2.00	.50	.55	1.50	.55	1.50	1.25	1.25	1.50	1.25	1.38	1.13	1.00	1.50	1.50	1.25	.....	1.25	1.25	1.13	1.38	1.25	1.38	.60
is, Tenn.	1.25	1.63	1.50	.50	.50	1.63	.75	1.57	1.50	1.50	1.25	1.57	1.58	1.63	1.13	1.50	1.50	1.25	.75	1.44	†	1.25	1.50	1.25	.....	.85
kee, Wis.	1.43	1.60	1.50	1.00	1.00	1.60	1.10	1.50	1.40	1.50	1.40	1.50	1.50	1.25	1.40	1.55	1.55	1.35	1.35	1.40	1.50	1.45	1.45	1.40	1.75	1.00
polis, Minn.	1.38	1.50	1.50	.93	.93	1.50	1.20	1.50	1.30	1.43	1.38	1.50	1.50	1.35	1.25	1.50	1.50	1.30	1.30	1.50	[d]1.38	1.50	1.63	[e]1.50	1.63	[f]1.20
, Ala.	1.38	1.63	1.50	.65	.75	1.63	.85	1.38	1.63	1.63	1.38	1.50	1.50	1.50	1.25	1.75	1.75	1.38	1.38	1.38	†	1.50	1.50	1.50	1.50	1.00
lle, Tenn.	1.25	1.63	1.50	.53	.53	1.50	.88	1.50	1.50	1.50	1.25	1.50	1.50	1.25	1.13	1.50	1.50	1.25	1.00	1.25	†	1.25	1.50	1.25	1.50	1.00
, N. J.	2.00	2.00	2.00	1.25	1.25	2.00	1.25	2.00	1.75	1.75	2.00	2.00	2.00	1.75	1.63	1.75	1.75	1.85	2.00	1.90	†	2.00	2.00	1.25	2.00	1.10
rleans, La.	1.25	1.50	1.50	.65	.75	1.50	.75	1.38	1.50	1.50	1.38	1.50	1.63	1.13	1.31	1.50	1.50	1.13	1.13	1.30	1.50	1.25	1.50	1.50	1.50	.80
York, N. Y.	1.85	2.00	2.00	1.10	.95	1.90	1.21	2.00	1.75	1.75	1.85	1.85	2.00	1.72	1.89	2.00	2.00	2.00	1.70	2.00	†	1.75	2.03	1.38	2.25	1.06
, Utah	1.25	1.58	1.50	.85	.85	1.50	1.25	1.50	1.25	1.25	1.25	1.50	1.50	1.38	1.50	1.50	1.50	1.25	.....	1.38	1.50	1.38	1.38	[g]1.75	1.65	.90
ma City, Okla.	1.38	1.63	1.75	.85	.65	1.75	1.00	1.63	1.75	1.75	1.25	1.50	1.63	1.25	1.50	1.75	1.75	1.13	1.25	1.25	1.38	1.50	1.63	1.25	1.50	1.13
, Nebr.	1.38	1.58	1.50	.70	.70	1.58	.75	1.50	1.38	1.38	1.38	1.50	1.50	1.20	1.20	1.50	1.50	1.10	1.10	1.25	1.50	1.25	1.25	1.13	1.50	.70
lphia, Pa.	1.58	2.00	2.00	.83	.83	1.50	.83	2.00	1.65	1.50	1.50	1.75	1.88	1.50	1.55	1.75	1.75	1.40	1.40	1.75	1.70	2.00	3.00	1.38	1.93	.85
ix, Ariz.	1.35	1.65	1.50	.83	.83	1.65	.88	1.50	1.65	1.65	1.38	1.50	1.50	1.25	1.25	1.50	1.50	1.25	1.25	1.25	†	1.38	.....	1.50	1.63	1.00
rgh, Pa.	1.75	1.90	1.75	.90	.80	1.63	.....	1.88	1.50	1.00	1.75	1.88	1.75	1.50	1.55	1.75	1.75	1.63	1.75	1.63	.....	1.75	1.84	1.84	1.84	.90
nd, Me.	1.16	1.50	1.44	.90	.90	1.50	1.00	1.50	1.50	1.50	1.50	1.50	1.35	1.10	1.10	1.50	1.50	1.25	1.50	1.25	†	1.50	1.88	1.50	1.88	.85
nd, Ore.	1.35	1.63	1.63	.95	.95	1.63	.....	1.60	1.35	1.50	1.35	1.50	1.50	1.32	1.38	1.63	1.63	1.40	1.40	1.38	1.38	1.45	1.70	1.40	2.00	1.00
h, N. C.	1.00	1.50	1.25	.40	.40	1.50	.50	1.50	1.25	1.25	1.10	1.50	1.25	1.00	1.00	1.50	1.50	.90	.90	1.00	1.50	1.00	1.25	1.15	1.25	.60
Nev.	1.50	2.00	1.75	.90	.90	1.50	1.00	1.75	.....	.....	1.50	1.75	1.53	1.50	1.50	1.63	1.63	1.50	.....	1.50	.....	.....	.....	1.50	1.60	.90
ond, Va.	1.13	1.63	1.50	.....	.....	1.63	.70	1.50	1.38	1.38	1.25	1.50	1.50	1.10	1.25	1.50	1.50	.....	.....	1.25	†	1.25	1.50	1.25	1.50	.75
uis, Mo.	1.50	1.75	1.75	.95	1.00	1.50	1.00	1.75	1.50	1.50	1.58	1.75	1.75	1.50	1.63	1.63	1.63	1.75	1.50	1.63	1.50	2.00	2.00	1.50	2.00	.90
ul, Minn.	1.38	1.50	1.50	.93	.93	1.50	1.20	1.62	1.30	1.43	1.38	1.50	1.50	1.35	1.25	1.50	1.50	1.30	1.30	1.50	1.50	1.50	1.63	[e]1.50	1.63	[f]1.20
ake City, Utah	1.25	1.58	1.50	.85	.85	1.50	1.25	1.50	1.25	1.25	1.25	1.50	1.50	1.25	1.50	1.50	1.50	1.25	.....	1.38	1.50	1.38	1.38	[g]1.75	1.65	.90
ntonio, Tex.	1.25	1.65	1.50	.50	.50	1.65	.58	1.50	1.50	1.50	1.50	1.50	1.50	1.13	1.13	1.63	1.63	1.25	.....	1.50	†	1.25	1.50	1.25	1.50	.50
iego, Calif.	1.35	1.50	1.63	.88	1.13	1.50	1.13	1.63	1.38	1.38	1.50	1.50	1.50	1.35	1.20	1.50	1.50	1.25	1.38	1.38	.....	1.38	1.38	1.50	1.75	1.00
rancisco, Calif.	1.50	1.88	1.75	1.00	1.00	1.88	.....	1.75	.....	.....	1.50	1.75	1.70	1.50	1.40	1.70	1.70	1.50	1.50	1.50	.....	1.50	1.50	1.63	2.00	.....
, Wash.	1.57	1.85	1.75	1.15	1.10	1.85	1.15	1.87	1.60	1.60	1.55	1.75	1.75	1.55	1.50	1.75	1.75	1.55	.....	1.65	1.75	2.00	2.00	1.70	2.00	1.35
field, Ill.	1.50	1.75	1.75	1.00	1.00	1.75	1.25	1.75	1.75	1.75	1.50	1.63	1.60	1.50	1.50	1.70	1.70	1.40	1.40	1.50	†	1.35	1.75	1.50	1.75	1.00
a, Wash.	1.48	1.75	1.68	1.10	.....	1.40	.....	1.73	1.50	1.50	1.50	.....	1.68	1.44	.....	1.68	1.68	1.44	.....	1.50	.....	1.75	1.75	1.70	1.70	1.25
a, Kan.	1.15	1.50	1.63	.60	.60	1.38	.75	1.50	1.38	1.38	1.38	1.50	1.38	.....	1.56	1.50	1.50	1.25	1.25	1.50	†	1.38	1.50	1.00	1.50	.85
on, N. J.	1.63	1.78	2.00	1.00	1.00	1.78	1.00	1.78	1.78	1.78	1.78	1.90	2.00	1.50	1.50	1.75	1.75	1.60	1.60	1.75	†	2.00	2.00	2.00	2.00	.88
, Okla.	1.25	1.63	1.38	.80	.65	1.65	.80	1.63	1.65	1.65	1.50	1.50	1.50	1.25	1.50	1.63	1.63	1.10	1.50	1.50	†	1.15	1.37	1.15	1.38	.80
ington, D. C.	1.70	1.90	2.00	.90	.90	1.75	1.10	2.00	1.65	1.65	1.60	1.75	2.00	1.71	1.65	1.75	1.75	1.75	1.62	1.75	†	1.72	2.00	1.25	2.00	.90
ington, Del.	1.38	1.83	1.90	.75	.75	1.63	1.10	1.63	1.38	1.40	1.50	1.50	1.75	1.33	1.55	1.60	1.60	1.70	1.20	1.63	†	1.65	1.65	1.65	1.80	.89

ote: Hourly rate figures rounded to closest cent where fractional parts of cent are quoted. † Welders rate same as trade in connection with which they work.

[a] Range from $1.45 to $1.75. [b] Range 55 to 75c. [c] $1.75 on private work. [d] Range $1.375 to $1.50. [e] Range $1.00 to $1.50. [f] Range 95c. to $1.20. [g] Range $1.43 to $1.75.

Yearly Average WAGES OF SIX BUILDING TRADES in Seven Cities

Bricklayers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.65	$0.70	$0.75	$0.70	$0.70	$0.875	$0.75
1914	.65	.75	.75	.70	.75	.875	.75
1915	.65	.75	.75	.70	.75	.875	.75
1916	.65	.75	.75	.70	.75	.875	.75
1917	.70	.75	.75	.70	.75	.875	.81
1918	.80	.81	.75	.875	.85	1.00	1.00
1919	.80	.875	.875	.875	1.00	1.125	1.125
1920	1.00	1.25	1.25	1.00	1.25	1.25	1.25
1921	1.00	1.25	1.25	1.00	1.25	1.25	1.125
1922	1.00	1.25	1.10	1.00	1.25	1.25	1.125
1923	1.25	1.50	1.10	1.125	1.50	1.375	1.25
1924	1.25	1.50	1.35	1.125	1.75	1.25	1.25
1925	1.25	1.50	1.50	1.25	1.75	1.25	1.35
1926	1.35	1.645	1.56	1.25	1.75	1.25	1.375
1927	1.40	1.75	1.625	1.25	1.75	1.375	1.375
1928	1.42	1.75	1.625	1.45	1.75	1.375	1.4275
1929	1.50	1.84	1.65	1.50	1.75	1.375	1.50
1930	1.50	1.925	1.70	1.50	1.75	1.375	1.50
1931	1.50	1.7125	1.70	.8125	1.75	1.375	1.1875
1932	1.105	1.47	1.40	.825	1.50	1.175	.975
1933	1.10	1.575	1.406	.812	1.50	1.125	1.01
1934	1.12	1.53	1.50	1.00	1.50	1.50	1.30
1935	1.20	1.50	1.50	1.00	1.50	1.50	1.00
1936	1.28	1.50	1.50	1.00	1.50	1.50	1.00
1937	1.50	1.725	1.62	1.33	1.50	1.60	1.54
1938	1.50	1.886	1.70	1.50	1.50	1.75	1.60
1939	1.50	1.893	1.70	1.50	1.50	1.75	1.60
1940	1.50	1.96	1.70	1.49	1.50	1.75	1.60
1941	1.50	2.00	1.70	1.448	1.396	1.75	1.6375
1942	1.573	2.00	1.721	1.75	1.563	1.771	1.715
1943	1.625	2.00	1.75	1.75	1.75	1.802	1.764

Hodcarriers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco
1913	$0.35	$0.375	$0.40	....	$0.4875	$0.50
1914	.35	.375	.40	....	.4875	.50
1915	.35	.375	.40	....	.4875	.50
1916	.35	.375	.425	....	.4875	.50
1917	.40	.425	.45	....	.4875	.50
1918	.425	.47	.50	....	.51	.625
1919	.50	.575	.575	....	.6375	.75
1920	.70	.775	1.00	....	.70	.93
1921	.70	.875	1.00	....	.85	1.00
1922	.70	.875	.725	....	.85	.71
1923	.70	.95	.725	....	1.00	.77
1924	.82	1.00	.725	$0.385	1.20	.8125
1925	.7625	1.00	.825	.6075	1.20	.8125
1926	.77	1.07	.88	.625	1.20	.8125
1927	.79	1.125	.925	.625	1.20	.875
1928	.805	1.125	.93125	.52	1.20	.875
1929	.85	1.15	.93	.50	1.20	.875
1930	.85	1.03125	.975	.50	1.20	.875
1931	.85	1.025	.975	.35	.875	.875
1932	.70	1.00	.825	.40	1.00	.70
1933	.70	.91	....	....	1.00	.70
1934	.70	.825	.825	....	.875	.70
1935	.70	.825	.825	....	.875	.70
1936	.77	.825	.95	.30-.40	.875	1.00
1937	.85	1.14	1.025	.40	1.00	1.10
1938	.85	1.14	1.025	.40	1.00	1.25
1939	.85	1.14	1.025	.40	1.00	1.25
1940	.85	1.186	1.025	.40	1.00	1.25
1941	.85	1.214	1.025	.4583	1.00	1.25
1942	1.00	1.214	1.063	.65	1.075	1.25
1943	1.00	1.214	1.063	.65	1.15	1.40

Carpenters

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.50	$0.625	$0.65	$0.525	$0.625	$0.625	$0.56
1914	.55	.625	.65	.45	.625	.625	.56
1915	.55	.625	.65	.45	.625	.625	.56
1916	.57	.625	.70	.45	.625	.625	.56
1917	.60	.69	.70	.45	.65	.68	.65
1918	.65	.69	.70	.55	.70	.75	.825
1919	.75	.75	.80	.65	.825	.875	.93
1920	1.00	1.125	1.25	.75	1.00	1.06	1.00
1921	1.00	1.125	1.25	.75	1.25	1.125	.875
1922	1.00	1.125	1.10	.75	1.10	1.04	.875
1923	1.05	1.125	1.25	.75	1.25	1.04	1.00
1924	1.05	1.3125	1.17	.76	1.525	1.00	1.00
1925	1.0875	1.3125	1.3475	.6025	1.50	1.00	1.0825
1926	1.20	1.45	1.39	.6575	1.50	1.00	1.125
1927	1.25	1.50	1.30	.95	1.50	1.125	1.125
1928	1.279	1.50	1.50	1.00	1.50	1.125	1.125
1929	1.38	1.55	1.47	1.00	1.50	1.125	1.125
1930	1.375	1.65	1.625	1.00	1.50	1.125	1.125
1931	1.175	1.45	1.625	.60	1.50	1.125	.875
1932	1.04	1.33	1.40	.60	1.275	.96	.695
1933	1.065	1.375	1.3125	.60	1.25	.90	.73
1934	.9375	1.40	1.3125	1.00	1.25	1.05	.83
1935	.9275	1.40	1.3156	1.00	1.25	1.10	1.00
1936	.937	1.40	1.50	.88	1.25	1.12	1.00
1937	1.14	1.60	1.57	1.06	1.35	1.31	1.23
1938	1.343	1.75	1.625	1.125	1.25	1.25	1.25
1939	1.375	1.75	1.625	1.125	1.25	1.25	1.25
1940	1.375	1.81	1.625	1.125	1.333	1.25	1.25
1941	1.24	1.85	1.625	1.099	1.333	1.291	1.325
1942	1.417	1.85	1.656	1.167	1.50	1.385	1.415
943	1.50	1.85	1.70	1.219	1.50	1.479	1.464

Plasterers

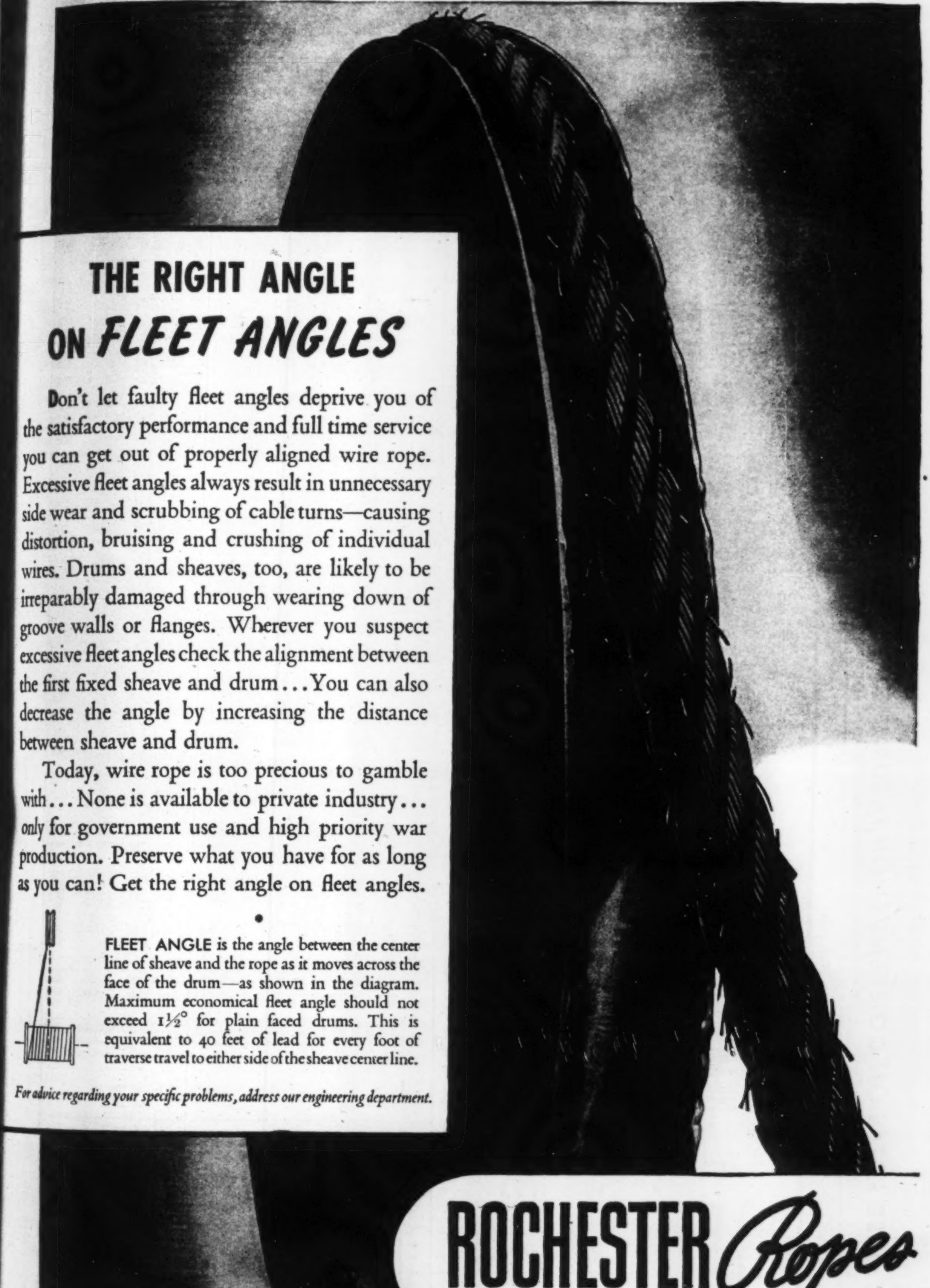
	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco
1913	$0.65	$0.69	$0.75	....	$0.75	$0.875
1914	.65	.69	.75	....	.75	.875
1915	.65	.69	.75	....	.75	.875
1916	.70	.75	.75	....	.75	.875
1917	.70	.75	.75	....	.75	.875
1918	.70	.75	.81	....	.875	1.00
1919	.80	.90	.875	....	1.00	1.125
1920	1.00	1.25	1.25	....	1.25	1.25
1921	1.25	1.25	1.25	....	1.375	1.375
1922	1.125	1.25	1.10	....	1.375	1.275
1923	1.125	1.25	1.50	....	1.50	1.275
1924	1.25	1.50	1.50	....	1.75	1.275
1925	1.25	1.50	1.50	....	1.75	1.50
1926	1.50	1.75	1.50	....	1.75	1.50
1927	1.50	1.75	1.625	....	1.75	1.50
1928	1.50	1.75	1.625	....	1.75	1.50
1929	1.50	1.75	1.625	....	1.75	1.375
1930	1.625	1.925	1.70	....	1.75	1.375
1931	1.50	1.7125	1.70	$1.00	1.75	1.375
1932	1.625	1.50	1.375	1.25	1.50	1.10
1933	1.375	1.50	1.375	....	1.50	1.10
1934	1.231	1.50	1.50	1.00	1.50	1.38
1935	1.375	1.50	1.50	1.00	1.50	1.25
1936	1.375	1.50	1.50	1.00	1.50	1.35
1937	1.625	1.80	1.62	1.00	1.51	1.51
1938	1.625	2.00	1.70	1.00	1.58	1.65
1939	1.625	2.00	1.70	1.00	1.58	1.60
1940	1.625	2.00	1.70	1.00	1.723	1.60
1941	1.625	2.00	1.70	1.271	1.75	1.639
1942	1.65	2.00	1.825	1.50	1.75	1.681
1943	1.667	2.00	1.825	1.50	1.75	1.75

Structural Ironworkers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco	Seattle
1913	$0.625	$0.625	$0.68	$0.625	$0.65	$0.75	$0.625
1914	.625	.625	.68	.625	.65	.75	.625
1915	.625	.625	.68	.625	.65	.75	.625
1916	.625	.66	.68	.625	.675	.75	.625
1917	.68	.68	.69	.625	.70	.75	.75
1918	.80	.80	.70	.75	.80	.875	.875
1919	.80	.875	.875	.80	.925	1.00	1.00
1920	1.00	1.125	1.25	1.00	1.25	1.125	1.125
1921	1.00	1.125	1.25	....	1.25	1.25	1.125
1922	1.00	1.125	1.05	....	1.06	1.125	1.00
1923	1.05	1.125	1.05	1.05	1.25	1.125	1.125
1924	1.16	1.29	1.25	1.00	1.45	1.125	1.125
1925	1.1375	1.4675	1.36	1.135	1.50	1.125	1.125
1926	1.23	1.60	1.405	1.25	1.50	1.125	1.125
1927	1.25	1.75	1.50	1.55	1.50	1.375	1.155
1928	1.3125	1.75	1.50	1.75	1.50	1.375	1.215
1929	1.375	1.81	1.57	1.63	1.57	1.375	1.25
1930	1.375	1.925	1.625	1.25	1.75	1.375	1.25
1931	1.375	1.925	1.625	.75	1.75	1.375	1.1875
1932	1.205	1.675	1.375	.75	1.50	1.13	1.13
1933	1.14	1.65	1.35	.75	1.47	1.20	1.10
1934	1.20	1.62	1.35	1.00	1.47	1.375	1.13
1935	1.20	1.65	1.35	1.125	1.47	1.375	1.23
1936	1.20	1.58	1.50	1.10	1.47	1.375	1.25
1937	1.375	1.79	1.58	1.25	1.73	1.44	1.39
1938	1.479	1.925	1.70	1.25	1.75	1.50	1.50
1939	1.60	1.925	1.70	1.25	1.75	1.50	1.50
1940	1.5625	1.9625	1.70	1.302	1.75	1.60	1.50
1941	1.50	2.00	1.70	.1469	1.75	1.60	1.5375
1942	1.588	2.00	1.725	1.50	1.75	1.625	1.615
1943	1.65	2.00	1.76	1.50	1.75	1.75	1.664

Common Laborers

	Boston	New York	Chicago	Birmingham	St. Louis	San Francisco
1913	$0.35	$0.225	$0.40	....	$0.25	$0.27
1914	.35	.225	.40	....	.25	.31
1915	.35	.25	.40	....	.25	.31
1916	.35	.25	.425	....	.25	.31
1917	.375	.30	.45	....	.30	.375
1918	.40	.405	.50	....	.365	.43
1919	.40	.405	.575	....	.425	.625
1920	.6875	.75	1.00	....	.6075	.75
1921	.6875	.60	1.00	....	.6075	.81
1922	.6875	.60	.725	....	.5575	.625
1923	.6875	.615	.725	....	.6075	.625
1924	.6625	.6875	.8175	$0.335	.70	.525
1925	.6025	.6525	.8175	.31	.6525	.525
1926	.615	.815	.86	.30	.6525	.525
1927	.595	.90625	.8875	.325	.5875	.55
1928	.6025	.90625	.90	.325	.60	.55
1929	.625	.985	.92	.29	.61	.57
1930	.625	1.03125	.975	.275	.6375	.6875
1931	.60	.65625	.7375	.20	.6125	.59375
1932	.575	.645	.665	.225	.56	.56
1933	.548	.725	.784	.248	.6223	.64
1934	.55	.8475	.825	.30	.7875	.64
1935	.575	.68	.825	.30	.7875	.625
1936	.581	.65	.95	.35	.7875	.651
1937	.725	.91	.99	.35	.86	.75
1938	.735	.912	1.025	.35	.663	.65
1939	.725	.912	1.025	.35	.663	.65
1940	.725	.912	1.025	.35	.804	.745
1941	.7875	.934	1.025	.4167	.875	.842
1942	.879	.991	1.056	.6375	.8875	.8875
1943	.90	.991	1.10	.65	.95	.95



THE RIGHT ANGLE ON *FLEET ANGLES*

Don't let faulty fleet angles deprive you of the satisfactory performance and full time service you can get out of properly aligned wire rope. Excessive fleet angles always result in unnecessary side wear and scrubbing of cable turns—causing distortion, bruising and crushing of individual wires. Drums and sheaves, too, are likely to be irreparably damaged through wearing down of groove walls or flanges. Wherever you suspect excessive fleet angles check the alignment between the first fixed sheave and drum . . . You can also decrease the angle by increasing the distance between sheave and drum.

Today, wire rope is too precious to gamble with . . . None is available to private industry . . . only for government use and high priority war production. Preserve what you have for as long as you can! Get the right angle on fleet angles.

•

FLEET ANGLE is the angle between the center line of sheave and the rope as it moves across the face of the drum—as shown in the diagram. Maximum economical fleet angle should not exceed 1½° for plain faced drums. This is equivalent to 40 feet of lead for every foot of traverse travel to either side of the sheave center line.

For advice regarding your specific problems, address our engineering department.

ROCHESTER *Ropes*

JAMAICA, NEW YORK • CULPEPER, VIRGINIA

BASE RATES ON COMPENSATION INSURANCE FOR CONSTRUCTION—APRIL 1, 1944

Data compiled by Herbert L. Jamison & Co., Insurance Brokers, New York, N. Y.

Classification of Work (A)	Ala.	Aris.	Ark.	Cal.	Colo.	Conn.	Del.	D. C.	Fla.	Ga.	Idaho	Ill.	Ind.	Iowa	Kans.	Ky.	La.	Me.	Md.	Mass.	Mich.	Minn.	Miss.(E)	Mo.	Mont.	Neb.
1. Carpentry — private residences	1.70	4.22	4.89	5.56	3.19	2.54	2.25	2.98	2.90	1.86	3.78	3.67	3.33	3.10	2.71	2.86	4.36	1.89	2.71	2.63	5.01	4.93	**2.86**	3.55	3.50	3.58
2. Carpentry — dwellings, 3 stories or less	1.70	8.28	4.89	5.56	3.19	2.54	2.25	2.98	2.90	1.86	3.78	3.67	3.33	3.10	2.71	2.86	4.36	1.89	2.71	2.63	5.01	4.93	**2.86**	3.55	3.50	3.58
3. Carpentry — interior trim	.90	8.28	2.64	5.56	1.56	1.84	2.25	1.81	1.01	1.09	1.85	1.43	1.19	1.26	1.43	1.31	1.92	1.36	1.51	1.67	2.16	4.93	**1.99**	3.55	1.69	1.83
4. Carpentry — general	2.29	8.28	8.65	5.56	4.22	6.03	2.25	4.37	2.90	4.46	6.20	5.90	4.69	3.40	5.20	4.17	5.79	5.53	5.67	7.60	5.01	4.93	**11.50**	3.55	5.76	6.11
5. Concrete and cement walk laying (B)	1.11	2.68	2.92	2.02	1.93	2.19	1.75	2.08	1.26	1.45	2.32	2.11	1.34	1.55	1.78	1.59	2.35	1.73	1.92	2.17	1.81	1.85	**2.61**	2.30	2.11	2.27
6. Concrete work — general (B)	2.65	8.50	8.79	5.20	4.10	5.97	2.25	4.08	3.37	2.59	6.15	5.07	3.11	3.76	5.20	4.33	7.76	3.46	4.34	5.48	6.23	5.83	**9.71**	5.40	5.21	6.20
7. Concrete work — dwellings, 3 stories or less (B)	1.54	8.50	4.10	5.20	2.97	3.84	2.25	3.68	1.50	1.22	3.00	2.28	1.81	1.70	2.24	1.64	2.92	3.08	4.01	5.10	2.80	2.13	**6.83**	3.45	2.74	2.62
8. Electric Wiring	1.11	2.83	2.56	2.57	1.68	1.84	1.15	2.22	1.41	1.61	2.09	1.67	1.36	1.36	1.54	1.43	2.33	1.58	1.59	1.43	1.63	2.18	**2.40**	2.07	1.89	2.14
9. Excavation — earth (C)	1.87	6.82	4.49	3.68	5.04	4.75	1.75	4.23	1.86	1.41	6.41	3.18	2.19	2.78	3.72	2.54	3.29	3.04	3.92	4.53	3.85	4.42	**5.34**	4.78	5.94	4.59
10. Excavation — rock (D)	3.14	11.33	8.47	8.30	5.57	6.49	1.75	6.90	3.89	3.57	7.17	5.08	4.21	4.22	5.18	4.81	(L)	4.63	5.16	8.53	7.39	6.05	**9.93**	6.63	6.38	.....
11. Glasing	2.53	5.52	6.80	5.93	4.43	4.89	.80	5.06	3.24	2.90	5.53	3.80	3.38	3.42	4.13	3.85	5.28	3.75	4.14	3.94	5.00	4.70	**3.71**	4.63	5.10	5.11
12. Lathing	1.19	4.07	3.54	5.15	2.09	2.40	1.00	2.42	1.34	1.41	(L)	1.77	1.59	1.66	1.95	1.79	2.54	1.83	2.01	2.56	2.61	2.03	**2.46**	2.96	2.35	2.43
13. Masonry	1.40	5.58	4.10	3.12	2.97	3.84	1.25	2.97	1.82	1.29	3.00	2.33	1.81	1.70	2.24	1.64	3.31	3.08	3.23	5.10	2.73	2.13	**6.83**	3.82	2.74	2.62
14. Painting (J)	1.85	5.29	4.99	5.03	3.02	3.31	1.55	3.59	1.84	1.77	4.30	2.59	2.99	2.40	2.89	3.32	3.69	2.71	3.01	(K)11.48	4.06	3.29	**3.21**	3.61	4.00	3.98
15. Plastering	1.40	3.57	3.89	5.15	2.58	2.75	1.00	2.87	1.82	1.29	3.10	2.30	1.94	2.01	2.40	2.09	2.78	2.21	2.35	3.10	2.70	2.60	**2.46**	3.65	2.85	2.97
16. Plumbing	.92	2.40	2.75	2.09	1.82	2.09	.75	2.04	1.23	.97	2.24	1.66	1.64	1.59	1.49	1.55	2.38	1.58	1.93	1.72	1.80	2.39	**2.94**	1.66	2.07	2.08
17. Roofing	4.71	9.78	10.70	10.41	7.43	8.89	1.50	8.18	3.93	4.13	10.61	10.71	6.58	7.68	8.00	6.09	8.45	7.00	8.57	10.40	14.33	10.14	**8.42**	7.89	9.82	9.85
18. Sheet metal erection	1.70	4.53	4.19	10.03	2.59	3.15	1.50	3.37	1.79	1.84	3.18	2.70	1.88	2.09	2.38	2.23	3.82	2.27	2.37	1.71	2.53	2.42	**6.25**	2.57	2.90	3.23
19. Steel erection — general	7.91	20.31	18.41	10.23	11.85	12.32	5.00	16.67	8.21	6.06	15.12	11.29	7.49	10.69	10.26	9.66	10.85	9.73	12.03	16.88	14.37	11.73	**19.06**	12.44	13.87	13.51
20. Steel erection — structural	8.29	20.31	24.57	17.66	20.38	17.18	5.00	20.07	10.87	10.14	21.31	9.85	10.86	11.72	16.04	14.99	16.76	12.05	13.51	20.34	29.32	15.85	**32.39**	21.20	19.98	18.87
21. Steel erection — interior ornamental	1.73	3.89	4.96	4.07	3.02	3.45	5.00	4.03	2.15	2.02	(L)	2.99	2.31	2.35	2.83	2.59	3.71	2.61	2.87	3.18	3.48	3.31	**7.35**	3.66	3.39	3.49
22. Steel erection — dwellings, 3 stories or less	4.16	8.04	12.58	17.66	7.43	8.77	5.00	8.23	5.56	5.59	9.84	7.59	5.86	(L)	7.68	6.81	9.31	7.15	7.82	20.34	9.47	8.04	**14.77**	10.91	9.18	9.10
23. Tile laying	.79	2.46	2.26	1.61	1.36	1.63	.50	2.20	1.01	.95	1.59	1.21	1.01	1.10	1.25	1.13	1.66	1.20	1.32	1.60	1.91	1.62	**1.39**	1.55	1.45	1.59
24. Watchmen and timekeepers (I)	1.75	4.07	4.19	(G)	3.09	3.58	(G)	3.53	2.24	2.12	3.65	2.94	2.31	2.43	2.83	2.59	3.74	2.68	2.89	3.52	3.71	3.36	**5.41**	3.69	3.35	3.58
25. Waterproofing	2.24	4.94	6.01	4.33	3.90	4.29	(N)	4.47	2.77	2.53	(L)	3.56	2.98	2.99	3.68	3.43	5.64	3.32	3.65	4.81	4.95	4.11	**3.33**	4.67	4.56	4.51
26. Wrecking	10.12	28.43	27.25	26.14	17.82	19.87	12.00	20.29	13.64	11.41	(L)	21.51	14.53	13.71	12.64	15.27	21.00	15.08	16.47	17.97	41.10	16.11	**23.44**	29.79	20.39	20.42

Classification of Work (A)	Nev.(F)	N. H.	N. J.	N. M.	N. Y.	N. C.	N.D.(F)	Ohio(F)	Okla.	Ore.(H)	Pa.	R. I.	S. C.	S. D.	Tenn.	Tex.	Utah	Vt.	Va.	Wash.(H)	W.Va.(F)	Wis.(F)	Wyo.
1. Carpentry — private residences	State Insurance Plan Nevada Industrial Commission, Carson City, Nev.	1.98	5.80	2.59	7.51	2.82	North Dakota State Plan: Workmen's Compensation Bureau, Bismarck, N. D.	Ohio State Plan: Workmen's Compensation, The Industrial Commission of Ohio, Actuarial Section, Columbus, Ohio	5.76	6.36	2.05	4.79	3.35	2.66	2.30	3.11	4.41	2.13	1.89	4.59	West Virginia State Plan: State Compensation Commission, Charleston, W. Va.	5.01	Wyoming State Plan: Manager, Workmen's Compensation Dept., State Treasurer's Office Cheyenne, Wyo.
2. Carpentry — dwellings, 3 stories or less		1.98	5.80	2.59	7.51	2.82			5.76	6.36	2.05	4.79	3.35	2.66	2.30	6.40	4.41	2.13	1.89	4.59		5.01	
3. Carpentry — interior trim		1.24	(L)	1.27	7.51	1.37			3.40	2.94	2.05	2.80	1.66	1.21	1.22	2.07	4.41	.96	.98	1.50		5.01	
4. Carpentry — general		4.19	7.50	4.15	7.51	4.47			9.27	7.49	2.05	11.84	6.77	3.30	3.88	6.40	4.41	3.22	3.47	6.08		5.01	
5. Concrete and cement walk laying (B)		1.53	4.00	1.58	4.09	1.53			4.18	3.19	2.75	3.45	2.33	1.47	1.49	2.28	2.90	1.21	1.12	2.30		2.61	
6. Concrete work — general (B)		3.89	9.90	3.65	9.54	3.90			12.62	6.69	5.00	10.27	7.35	3.69	3.00	6.40	10.00	2.69	3.26	5.15		5.38	
7. Concrete work — dwellings, 3 stories or less (B)		2.81	8.40	1.96	9.54	1.84			4.86	5.83	5.00	5.51	2.79	1.51	1.65	6.40	4.12	2.34	1.40	4.48		3.22	
8. Electric Wiring		1.31	2.30	1.35	2.97	1.47			4.08	3.29	1.45	2.67	2.15	1.26	1.45	2.07	2.44	1.04	1.08	2.53		2.43	
9. Excavation — earth (C)		3.33	8.30	4.13	9.42	3.00			7.57	7.46	2.75	8.25	4.10	2.56	2.13	4.25	7.18	2.69	1.91	5.39		5.21	
10. Excavation — rock (D)		4.24	10.90	4.42	11.42	7.21			11.85	(L)	2.75	10.42	6.64	(L)	4.13	6.63	8.06	3.29	3.22	10.49		8.26	
11. Glasing		3.41	7.20	3.55	10.71	3.92			9.45	6.73	1.40	8.31	5.33	3.02	3.34	5.26	3.50	2.66	2.61	5.17		7.91	
12. Lathing		1.64	5.10	1.69	3.17	1.86			4.54	5.72	1.40	3.84	2.46	1.52	1.63	2.75	3.50	1.28	1.26	4.04		3.56	
13. Masonry		2.81	8.30	1.96	8.47	1.71			4.86	5.83	2.20	5.51	2.67	1.57	1.65	6.40	4.41	2.34	1.17	4.48		3.17	
14. Painting (J)		2.51	8.30	2.67	8.56	2.27			6.29	6.67	2.75	6.41	3.71	2.53	2.23	2.76	4.00	2.07	2.03	5.13		3.03	
15. Plastering		2.03	5.50	2.04	5.65	1.94			5.38	5.72	1.40	4.98	2.70	1.88	1.79	2.81	5.50	1.56	1.26	4.04		2.33	
16. Plumbing		1.51	3.60	1.87	4.10	1.25			3.59	2.91	1.30	2.92	1.82	1.43	1.16	1.70	1.96	1.24	1.24	2.24		2.05	
17. Roofing		6.71	12.70	6.62	19.98	4.91			18.32	15.59	2.75	16.36	9.18	5.77	4.45	8.52	12.56	5.15	1.24	(L)		13.37	
18. Sheet metal erection		2.03	4.30	2.10	6.01	1.97			5.05	6.42	2.75	4.57	2.84	1.90	1.91	2.56	4.00	1.61	1.77	4.59		4.33	
19. Steel erection — general		9.08	15.80	8.84	26.80	11.69			26.08	25.39	8.50	23.06	13.40	7.32	9.07	10.71	20.00	6.96	6.08	12.98		12.55	
20. Steel erection — structural		12.71	23.60	14.02	42.17	13.36			35.89	25.39	8.50	30.58	19.82	10.33	10.48	16.23	20.00	9.72	9.86	19.52		12.55	
21. Steel erection — interior ornamental		2.36	(L)	2.43	5.64	2.66			6.63	5.94	8.50	5.62	13.48	2.19	2.36	3.80	4.48	1.84	1.80	4.57		4.31	
22. Steel erection — dwellings, 3 stories or less		6.18	12.60	6.32	15.56	7.00			16.16	12.19	8.50	16.27	9.98	5.05	5.88	16.23	9.94	4.73	4.74	9.53		10.34	
23. Tile laying		1.09	2.15	1.11	3.68	1.16			2.96	2.10	.85	2.39	1.51	1.07	1.07	1.70	3.80	.85	.83	1.62		1.70	
24. Watchmen and timekeepers (I)		2.39	(L)	2.47	9.27	2.66			6.63	5.45	(G)	5.52	3.01	2.32	2.40	(G)	4.56	1.90	1.87	4.69		4.91	
25. Waterproofing		2.99	7.20	3.14	(N)	3.49			8.25	4.70	(N)	7.41	4.04	2.58	2.92	4.65	5.70	2.34	2.29	(L)		5.95	
26. Wrecking		13.76	30.70	14.27	(M)	15.67			38.21	32.43	20.00	33.31	20.61	12.28	13.51	22.09	43.09	10.67	10.91	24.93		45.26	

Note: Base rates — in effect April 1, 1944 — subject to increase or decrease according to experience ratings. (A) Special rates for government projects. (B) Includes construction of forms. (C) Includes blasting, but not caisson or cofferdam work. (D) Special rates for occupational disease coverage. (E) Employers liability rates — no compensation law. (F) Compensation must be insured in Monopolistic State Fund. (G) Assign operation to principal classification. (H) Operation specified as hazardous by law must be insured in State Fund. (I) Not available if general contractor is conducting operations at job. (J) Painting of bridges and steel structures rated as steel erection. (K) Painting indoors — rate of 1.12 in Mass. (L) Rate available only on application to company. (M) Wrecking of structures based on cubic content. (N) Waterproofing rated according to type.

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CE will be here . . . *and new battles* *ou.* You know, as well as we do, rivalry for business that will take e among the best contracting firms he country.

n meeting this competition and on jobs you win, you will face many blems . . . that's where American tual comes in for it is superbly ipped to help you solve most of n. Insurance protection, accident ention and *operating economy* give you less worry, if you get the efit of American Mutual's long, tical experience in helping contors get jobs done right—*and on*

Benefit from the "extras" American Mutual assures you: (1) construction-wise safety engineering experience, (2) construction-wise claim and medical service, (3) proved lower insurance costs*, (4) trained insurance experts, and (5) the confidence inspired by American Mutual's name on any contract. Our "Five Extras" booklet describes them. Get your *free copy* today.

And if you haven't a copy of American Mutual's other famous booklet, "Foremanship and Accident Prevention in Construction," send for that one, too — today. It's free. American Mutual Liability Insurance Company, Dept. O-29, 142 Berkeley Street, Boston 16, Massachusetts.

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Roadbuilding Costs

THE PRICE TREND in highway construction for a composite standard mile continued upward during the first half of 1943, but declined sharply in the last half. Composite mile costs reached the highest annual value recorded by the Public Roads Administration Index.

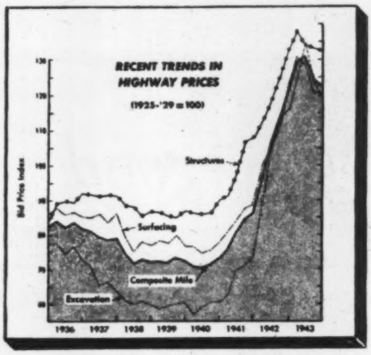
The PRA Index is based on average prices in the 1925-'29 period for a composite mile of road. It includes excavation, surfacing and structures. Quantities involved are considered as constant for the index, but in actual practice, of course, they vary from job to job.

Highway excavation bid price rose from 41c. per cubic yard in the final 1942 quarter to 47c. in the second quarter of 1943, but by the end of the year had returned to 42c. The 1943 average, 44.3c., is below the record of 47c. in 1923.

Surfacing costs rose from $2.73 per square yard in the last 1942 quarter to $2.90 in the opening 1943 quarter, then declined to $2.70 in the third and fourth quarters. The year's average, $2.78, topped all other annual figures.

The structures index for 1943, 134.4, was at a new high as the averages for its three componen reinforcing steel (6.7c.), struc steel (9.5c.), and structural con ($30.19)—all climbed above prev records.

Bid price averages and cost ind are shown in the table below.



Price Trend in Highway Construction for Composite Standard

Year	Excavation [1] (17,491* cubic yards)		Surfacing [2] (3,726* square yards)		Structures			
					Reinforcing steel (16,000* pounds)	Structural steel (4,325* pounds)	Structural concrete (68* cubic yards)	Combined
	Bid price [3]	Sub-index	Bid price [3]	Sub-index	Bid price [3]	Bid price [3]	Bid price [3]	Sub-index
Base period, 1925 to 1929..	$0.35†	100.0	$2.22†	100.0	$0.052†	$0.067†	$22.15†	100.0
1922..........	.40	114.5	2.28	102.7	.050	.074	20.18	95.1
1923..........	.47	133.3	2.43	109.5	.057	.078	23.37	108.6
1924..........	.43	122.2	2.40	108.3	.057	.077	22.91	107.2
1925..........	.39	110.0	2.36	106.4	.056	.067	22.53	103.9
1926..........	.36	103.7	2.29	103.1	.053	.074	22.76	103.7
1927..........	.35	100.3	2.29	103.3	.051	.071	22.65	101.5
1928..........	.34	96.0	2.10	94.5	.049	.067	21.22	96.1
1929..........	.32	90.0	2.05	92.7	.048	.059	21.58	95.0
1930..........	.30	86.3	1.86	84.1	.045	.061	20.08	89.4
1931..........	.27	77.2	1.68	75.6	.040	.054	18.02	79.9
1932..........	.18	52.3	1.45	65.2	.034	.046	15.32	68.0
1933..........	.26	73.6	1.67	75.1	.037	.046	16.15	72.1
1934..........	.29	82.8	1.91	86.0	.043	.053	17.73	80.8
1935..........	.26	73.7	1.90	85.5	.044	.052	17.78	81.5
1936..........	.26	75.4	1.91	86.3	.046	.060	20.25	90.0
1937..........	.23	66.7	1.89	85.0	.048	.066	19.76	91.5
1938								
1st Q........	**.21**	**61.0**	**1.77**	**79.8**	**.046**	**.065**	**19.13**	**88.6**
2nd Q........	**.21**	**60.1**	**1.67**	**75.2**	**.046**	**.064**	**19.10**	**88.2**
3rd Q........	**.21**	**60.7**	**1.73**	**77.8**	**.044**	**.061**	**18.73**	**85.4**
4th Q........	**.21**	**59.8**	**1.70**	**76.7**	**.044**	**.060**	**19.29**	**86.7**
1939								
1st Q........	**.21**	**58.7**	**1.73**	**78.0**	**.043**	**.058**	**19.46**	**86.4**
2nd Q........	**.21**	**59.3**	**1.72**	**77.4**	**.043**	**.059**	**19.03**	**85.4**
3rd Q........	**.21**	**60.1**	**1.76**	**79.4**	**.043**	**.060**	**18.95**	**85.1**
4th Q........	**.21**	**60.4**	**1.71**	**76.9**	**.045**	**.060**	**19.07**	**86.8**
1940								
1st Q........	**.20**	**57.0**	**1.69**	**76.1**	**.045**	**.061**	**18.88**	**86.2**
2nd Q........	**.21**	**58.7**	**1.65**	**74.6**	**.043**	**.061**	**19.07**	**85.9**
3rd Q........	**.21**	**60.4**	**1.67**	**75.3**	**.044**	**.064**	**18.95**	**86.3**
4th Q........	**.21**	**60.4**	**1.72**	**77.7**	**.046**	**.066**	**19.79**	**90.0**
1941								
1st Q........	**.22**	**62.4**	**1.78**	**80.4**	**.047**	**.066**	**19.99**	**91.3**
2nd Q........	**.24**	**69.5**	**1.86**	**83.8**	**.051**	**.075**	**20.88**	**97.6**
3rd Q........	**.25**	**71.2**	**1.94**	**87.5**	**.057**	**.080**	**22.56**	**106.4**
4th Q........	**.26**	**74.4**	**1.96**	**88.6**	**.060**	**.082**	**22.32**	**107.8**
1942								
1st Q........	**.31**	**87.5**	**2.21**	**99.7**	**.061**	**.084**	**23.72**	**112.6**
2nd Q........	**.36**	**103.1**	**2.34**	**105.3**	**.063**	**.091**	**24.93**	**118.3**
3rd Q........	**.40**	**114.0**	**2.46**	**110.8**	**.066**	**.095**	**26.97**	**125.6**
4th Q........	**.41**	**115.7**	**2.73**	**123.0**	**.070**	**.091**	**29.01**	**132.8**
1943								
1st Q........	**.44**	**124.5**	**2.90**	**130.8**	**.073**	**.093**	**30.02**	**137.6**
2nd Q........	**.47**	**134.5**	**2.83**	**128.6**	**.067**	**.092**	**30.17**	**134.3**
3rd Q........	**.44**	**123.9**	**2.70**	**120.7**	**.067**	**.097**	**29.48**	**133.1**
4th Q........	**.42**	**119.6**	**2.70**	**120.7**	**.059**	**.096**	**31.08**	**132.4**

[1] Common excavation plus other excavation items expressed as equivalent common excavation.

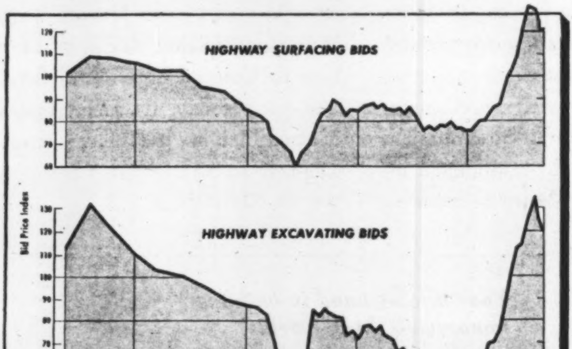
[2] Portland-cement concrete plus other surfacing items expressed as equivalent portland-cement concrete.

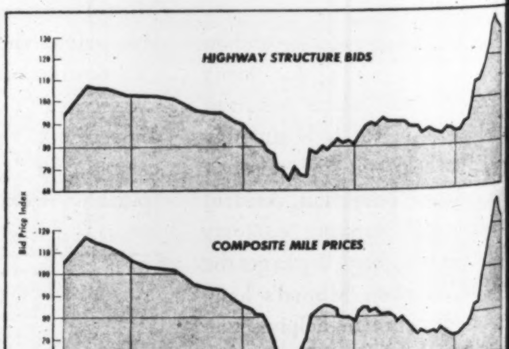
[3] Indexes and totals were calculated with the bid prices carried to one more decimal place than that to which are shown in this table.

Column showing amount of bid price times fixed quantity omitted in this table.

* Fixed quantities used for establishing composite mile for price trend.

† Fixed prices used for establishing composite mile index base.





THE *New* HELTZEL
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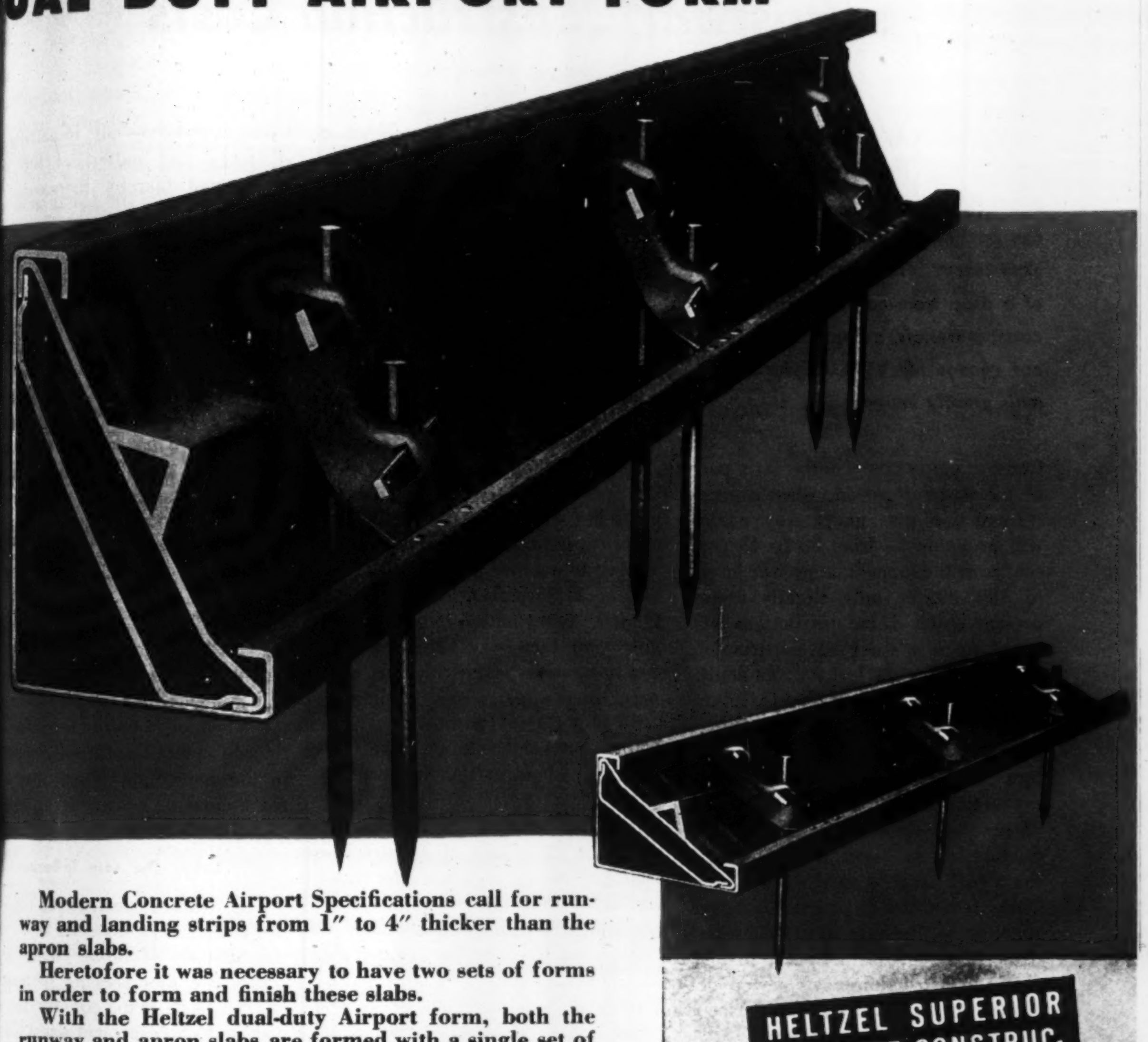

Modern Concrete Airport Specifications call for runway and landing strips from 1″ to 4″ thicker than the apron slabs.

Heretofore it was necessary to have two sets of forms in order to form and finish these slabs.

With the Heltzel dual-duty Airport form, both the runway and apron slabs are formed with a single set of forms.

Stake pockets and wedges are arranged so that the form can be used with either dimension upright. Double treads permit the use of finishing machines in either position. Heavy 1/4″ steel plate assures maximum service. Another Heltzel Victory Development.

Complete Details in Bulletin B-19-A

Fig. 1. Setting forms for a 15″ concrete airport runway.

Fig. 2. Finishing a slab 25′ wide, 15″ thick in one pass.

Fig. 3. The same set of forms used with the 10″ base as the webb.

HELTZEL SUPERIOR CONCRETE CONSTRUCTION EQUIPMENT

- MILITARY HIGHWAY FORMS
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- DUAL DUTY AIRPORT HIGHWAY FORMS
- CURB, CURB AND GUTTER OR SIDEWALK FORMS
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- CONCRETE FLOOR HOPPERS
- CONCRETE BUCKETS

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Postwar Construction Costs

Contents in Brief—*Construction costs will probably fluctuate within a narrow range from now to the end of the war, and then will settle down to about present levels of 25 to 45 percent over immediate prewar prices as the postwar construction program gets under way. While the sharp rises experienced after World War I will not materialize, there are no possibilities of a drop from current levels. Labor is the uncertain element in projecting costs; materials, except lumber, which must come down, and equipment will not change much from present prices unless labor costs at the plants and mills greatly increase.*

CONSTRUCTION COSTS in the early part of the postwar period, when normal construction gets under way again, will probably be from 25 to 45 percent over the immediate prewar levels of 1938-40, or only slightly above present costs. These predictions are based upon a study of construction costs following the last war, an analysis of present and probable future conditions, and opinions expressed by many engineers, architects, contractors and material and equipment manufacturers. From now to the end of the war we can look for minor fluctuations in costs, leveling off to the slight increase mentioned above. There is nothing in present or future pictures to indicate any substantial drop in costs; furthermore, history shows construction costs never decline from an established level except in deep economic depressions.

A review of cost trends during and following World War I shows the construction cost index rising 39 to 45 percent in the two war years over the 1916 level. Then a short inflationary burst in 1920 sent both wages and materials prices soaring, pushing costs up to 93 percent above the 1916 index. The price curve fell just as rapidly as it rose, but settled down, after a momentary drop in 1922, to a sustained level about 61 percent higher than the prewar values and 17 percent over the wartime prices, for the remainder of the 1920's. Building costs, as differentiated from all construction costs, followed a similar pattern with smaller fluctuations, as skilled labor rates did not vary to the same extent as did common labor wages.

In 1932 the depression dropped the cost index curve below the 1917-18 mark, but with a resumption of normal construction activity prices climbed to another plateau in the late 30's, about 85 percent over the 1925-29 level. As the nation swung into defense and then war activities, construction costs rose with the ever-increasing wage scales until they stand today at 41 percent above immediate prewar levels. Building costs show only about half of this increase.

Sharp rise not expected

So far the trend of construction costs has closely followed the previous war pattern. However, the freakish sharp upswing experienced in 1920 is not likely to be repeated this time. That sudden rise was caused by a spurt in both materials prices and labor rates. Present governmental control of prices and wages, certain to continue at least for a time into the peace-time era, precludes a similar wild jump.

In the immediate future—from now to the end of the war—construction costs will be torn by the conflicting influences of shortage of materials and good mechanics, and the competition of contractors to grab off what little work there may be coming out in order to keep their organizations intact. During the past two years construction labor costs have increased faster than hourly wage rates. Many of the younger workers have joined the armed services, some have gone into war industries. Those left have been under the psychological influence of plenty of jobs, shortage of workers, rush projects, cost-plus-fixed-fee contract conditions—all impairing efficiency and output of the la forces and thereby increasing costs.

Looking again at the present ture, the war has spawned a g number of new construction fir Foremen and superintendents of companies left to form new outfi groups of former small firms co bined into new large units. Many these newly-formed contractors n face lack of work and bid competiti for the first time. Their bonanza da of having profitable work hand them without competition are ov They now want work, and they a bidding the few jobs being let tod at prices the older firms believe to fantastically low. Some will survi and get by, others will go broke a disintegrate. Their presence, howev will influence bid prices—the cos the buyer of construction—for so time to come. Cut-throat competiti in the immediate future may che the increasing costs due to lesseni of labor efficiency.

Labor the sole influence

The trend of construction costs i the postwar era depends solely up the attitude of labor. While a f trades are now seeking increases various parts of the country, the te ency is to hold present gains. In fa some building and constructi trades leaders are advocating creases in hourly rates, recogniz that too-high labor costs stifle co struction and thus reduce the opp tunity for their members to wo Contractors know from past exp ence that soldiers returning to pea time jobs will be restless and uns tled for a while, many will requ time to restore their working abili But if they show a *willingness* to w labor efficiency can be maintain which means costs will be kept und control.

Most construction authorities l for materials prices to hold fai steady, consistent with producti labor costs. Postwar competition materials will prevent much of increase, in fact, might in some ca prices downward. Lumber, it is eed, is at present way out of line must come down in price to re- n a popular construction mate-

quipment manufacturers, faced high shop costs, feel that im- ved operating efficiency of new hinery will offset whatever price eases may be necessary. They n against expectations of greatly ced operating costs from fancied r-duper lines of new equipment will not materialize. Manufacturers point out the greatest possibility in keeping construction costs down through use of equipment is by improved job management.

Business costs to remain high

The increased expense of doing business will prevent construction costs from returning to pre-war levels. New and heavier taxes imposed since the war started—certain to remain for a long time—alone will keep costs up to their present basis. Taxes on transportation, communications, real estate, materials and equipment, social security imposts, income and corporation taxes all mean higher fixed charges that raise the base of all construction costs.

The American system of free enterprise, the ability, ingenuity and experience of architects, engineers and contractors will keep the cost of the postwar construction program as low as possible under existing conditions. That is the pledge of the entire construction industry to the American public.

Kentucky Highway Unit Bid Price Averages

erage Unit Prices for Successful Bids—Kentucky Department of Highways

(Principal Items Only)

		During the years ending:		
Item	Unit	Mar. 31, 1942	Dec. 31, 1942	Dec. 31, 1943
lt, rock	Tons	$7.05	$12.14	$13.43
lt cutback, MC-3	Gal.	.105	.136	.114
lt cutback, RC-2	Gal.	......	.174	.150
lt cutback, paint coat	Gal.	.111	.097	.153
lt cutback, paint coat	Sq. yd.	.03	......	......
tabilised	Sq. yd.	.116	......	......
inous concrete base	Tons	4.751	6.71	6.89
inous concrete binder	Tons	4.838	7.91	7.88
inous concrete surface	Tons	4.904	7.33	7.76
inous base, Class F	Tons	3.916	......	6.70
inous binder, Class F	Tons	4.383	......	7.23
inous surface, Class F	Tons	5.209	7.40	6.53
m chloride	Tons	28.355	......	......
basins, remove	Each	6.10	35.00	16.13
basins, standard	Each	72.50	145.58	......
nt	Bbl.	......	......	2.86
ng and grubbing	Acre	28.412	48.59	87.94
ete, Class A	Cu. yd.	22.652	26.42	32.23
ete, Class B	Cu. yd.	18.804	23.25	25.21
ete, Class D	Cu. yd.	52.691	61.39	81.54
header	L. ft.	.90	1.50	1.50
header, remove	L. ft.	.142	.56	......
integral	L. ft.	.408	.44	.40
lip	L. ft.	.078	.10	.164
and gutter, concrete	L. ft.	1.149	1.53	2.24
and gutter, remove	L. ft.	.104	.32	.55
es, surface 1 sq. ft.	L. ft.	.058	.09	.10
es, surface 2 sq. ft.	L. ft.	.237	.15	.237
ing strip, concrete	Sq. yd.	2.50	......	......
ation — roadway	Cu. yd.	.345	.62	.527
ation — borrow	Cu. yd.	.316	.52	.45
ation — structure, unclass	Cu. yd.	1.572	2.26	2.52
ation — structure, common	Cu. yd.	3.612	2.17	4.85
ation — structure, S. R.	Cu. yd.	4.754	4.57	7.59
v.— trench and shoulder	Cu. yd.	.251	.37	.58
dressing	Station	8.231	12.66	13.87
s	L. ft.	2.006	2.08	2.44
r work	Mile	......	......	50.00
l, bank or creek	Tons	1.061	.80	2.53
l, river	Tons	1.509	......	2.25
d rail	L. ft.	1.483	......	......
d rail, remove	L. ft.	......	.29	1.00
walls, remove	Each	4.732	6.22	8.70
e, remove and reset	L. ft.	.349	.55	.50
tone, crushed, traffic bound	Tons	1.869	2.39	2.55
tone, crushed, base	Tons	1.721	2.19	2.98
tone, crushed, coarse aggregate	Tons	2.018	3.98	3.50
tone, crushed, chips	Tons	2.072	2.18	3.75
tone, crushed, surface mix	Tons	2.90	2.40	3.75
tone, crushed, fine surf. mix	Tons	2.089	2.75	......
er, untreated	Mfbm.	......	......	150.00
ry, first class, stone	Cu. yd.	12.994	13.00	25.00
ry, culvert, stone	Cu. yd.	17.326	......	......
ry, concrete, remove	Cu. yd.	4.107	3.51	4.31
ry, stone, remove	Cu. yd.	2.021	3.20	5.24
haul	Sta. yd.	.014	.021	.022
ent, cem. concrete (plain)	Sq. yd.	2.165	2.40	2.58
ent, cem. conc. (for patching)	Cu. yd.	......	......	30.20
ent, cement, concrete, remove	Sq. yd.	.182	.54	.84
ent crossovers	Each	......	171.67	126.00
g, stone	Sq. yd.	3.11	......	3.00
g, steel	L. ft.	2.702	......	......
concrete, 14-in.	L. ft.	2.624	......	3.96
concrete, 18-in.	L. ft.	4.291	......	7.00
concrete, 20-in.	L. ft.	......	......	7.50

		During the years ending:		
Item	Unit	Mar. 31, 1942	Dec. 31, 1942	Dec. 31, 1943
Piling, treated timber	L. ft.	1.797	1.75	2.40
Pipe, bitm. coated, corr. metal, 18-in	L. ft.	2.471	......	......
Pipe, bitm. coated, corr. metal, 24-in	L. ft.	3.00	......	......
Pipe, perforated, corr. metal, 8-in	L. f.	.829	......	......
Pipe, perforated, corr. metal, 15-in	L. ft.	1.50	......	......
Pipe, entrance, corr. metal, 15-in	L. ft.	1.374	......	2.49
Pipe, entrance, corr. metal, 18-in	L. ft.	1.878	......	......
Pipe, entrance, corr. metal, 24-in	L. ft.	2.524	......	2.91
Pipe, entrance, corr. metal, 36-in	L. ft.	4.00	......	......
Pipe, railing, galv. iron, 2-in	L. ft.	1.25	......	......
Pipe, railing, wrt. iron, 3-in	L. ft.	4.50	......	......
Pipe, culvert, concrete, 12-in. (plain)	L. ft.	1.334	2.75	2.00
Pipe, culvert, concrete, 15-in. (plain)	L. ft.	1.293	2.19	1.88
Pipe, culvert, concrete, 18-in. (plain)	L. ft.	1.891	2.46	2.39
Pipe, culvert, concrete, 24-in. (plain)	L. ft.	2.84	3.37	3.28
Pipe, culvert, concrete, 30-in. (reinf.)	L. ft.	3.703	4.38	4.74
Pipe, culvert, concrete, 36-in. (reinf.)	L. ft.	4.896	5.88	6.03
Pipe, culvert, concrete, 42-in. (reinf.)	L. ft.	6.178	7.62	7.00
Pipe, culvert, concrete, 48-in. (reinf.)	L. ft.	8.533	8.25	......
Pipe, culvert, concrete, 54-in. (reinf.)	L. ft.	......	14.67	......
Pipe, sewer, concrete, 8-in	L. ft.	.75	1.44	......
Pipe, sewer, concrete, 15-in	L. ft.	1.25	1.50	......
Pipe, sewer, concrete, 18-in	L. ft.	1.75	......	......
Pipe, cast iron, 18-in	L. ft.	5.00	......	......
Pipe, wrought iron, 6-in	L. ft.	4.00	......	......
Pipe, extra strength, 24-in	L. ft.	3.235	3.84	......
Pipe, concrete, 54-in., extra strength	L. ft.	......	17.50	......
Pipe, concrete, entrance, 12-in. (plain)	L. ft.	......	1.10	1.60
Pipe, concrete, entrance, 15-in. (plain)	L. ft.	1.50	1.74	1.88
Pipe, concrete, entrance, 18-in. (plain)	L. ft.	......	2.22	2.70
Pipe, concrete, entrance, 24-in. (plain)	L. ft.	2.50	3.10	3.11
Pipe, concrete, entrance, 30-in. (plain)	L. ft.	......	4.50	......
Pipe, concrete, entrance, 36-in. (reinf.)	L. ft.	......	6.14	6.00
Pipe, removing	L. ft.	.494	.93	.96
Pipe, relaying	L. ft.	.496	.96	1.24
Plates, lead	Lb.	.217	......	......
Plates, bronze	Lb.	.57	......	......
Project monuments	Each	12.628	16.36	18.15
Riprap	Sq. yd.	2.39	3.50	2.55
Sandstone, crushed, base	Tons	1.80	......	......
Scarifying and reshaping	Sq. yd.	.036	.07	.09
Sidewalk, concrete	Sq. yd.	1.912	2.85	2.89
Sidewalk, concrete, removing	Sq. yd.	.191	.23	1.64
Sidewalk, brick, removing	Sq. yd.	.259	.40	......
Slag, crushed, traffic bound and base	Tons	2.536	4.00	3.08
Slag, crushed, coarse aggregate	Tons	2.80	......	3.00
Slope protection	Sq. yd.	2.751	2.86	2.99
Stabilized base	Sq. yd.	......	......	.29
Steel, reinforcing	Lb.	.055	.06	.06
Steel, structural	Lb.	.09	.15	.25
Stone fence, remove	L. ft.	.859	1.45	......
Stone fence, remove and rebuild	L. ft.	2.943	......	......
Spring box	Each	140.714	75.00	241.67
Tar, refined, RT-1	Gal.	.131	......	......
Tar, refined, RT-3	Gal.	.121	.176	.179
Traffic stripe, permanent	L. ft.	.045	.04	......
Trees and stumps, remove	Each	7.342	24.33	22.41
Timber, untreated	Mfbm.	77.892	......	150.00
Timber, treated	Mfbm.	142.769	194.03	190.98
Valley gutter, concrete	L. ft.	2.50	3.15	3.50
Water	100 Gal.	.113	.21	.16
Wrought iron	Lb.	......	......	.15

Construction Equipment Rental Rates

EQUIPMENT RENTAL RATES were established May 11, 1942 by the Maximum Price Regulation No. 134 with rates fixed at about those of the Associated Equipment Distributors "Green Book."

As revised under dates of Oct. 16 and Nov. 23, 1942, the regulation lists dollar and cents maximum rental rates for month, week or day for machines common to constructio Rates given are for actual use of not more than 8 hours in calendar day with a maximum of 50 percent added for use u to 16 hours and 100 percent up to 24 hours. Prices are f machines "bare" without fuel, lubricants or operators, or f repairs or maintenance charges.

Sample equipment rental rates from Maximum Price Regulation No. 134 through Amendment No. 13

	Per Month	Per Week	Per Day
Air Compressors			
Portable, gasoline 95–130 cu. ft. 100 psi	$130	$43	$11.00
Portable, gasoline 180–260 cu. ft. 100 psi	260	87	22.00
Portable, diesel 180–260 cu. ft. 100 psi	298	99	25.00
Portable, diesel 460–560 cu. ft. 100 psi	608	203	51.00
Stationary, electric 160–215 cu. ft. 100 psi	155	52	13.00
Stationary, electric 470–570 cu. ft. 100 psi	280	93	23.00
Stationary, electric 900–1200 cu. ft., low pressure	365	121	30.00
Air Tools			
Clay spades, small	20	10	2.50
Drifters	65	22	6.00
Hoists to 1500-lb. single-drum	50	18	4.50
Hoists, 1500–2500 lb. double-drum	80	27	6.50
Hose, over ⅝ in. 50-ft. length	6	3	1.50
Jack-hammer 51–68 lb	35	12	3.00
Paving breakers 70–90 lb	35	15	3.50
Rivet hammers	25	10	3.50
Vibrators, concrete, medium	45	18	4.50
Wagon drill (with air hoist)	165	50	10.00
Boilers			
Vertical 18–32 hp	75	25	6.50
Vertical 32–55 hp	100	33	8.50
Horizontal 55–70 hp	110	37	9.00
Horizontal 90–125 hp	175	58	15.00
Buckets			
Clamshell ⅜ cu. yd	67	22	5.50
Clamshell ¾ cu. yd	90	30	7.50
Clamshell 1½ cu. yd	140	46	11.50
Concrete bottom-dump 1 cu. yd	35	11½	3.00
Concrete bottom-dump 2 cu. yd	50	16¾	4.25
Dragline 1 cu. yd	85	28	7.00
Dragline 1½ cu. yd	105	35	8.75
Dragline 2 cu. yd	125	42	10.50
Orangepeel 1¼ cu. yd	175	58	14.50
Bulldozers—see tractors			
Concrete carts 6 cu. ft. rubber tired	12	4	1.00
Concrete carts 9–11 cu. ft. rubber tired	15	5	1.50
Cranes (capacity at ft. radius)			
Crawler gasoline 5–7 ton 12	450	150	38.00
Crawler gasoline 14–19 ton 12	675	225	56.00
Crawler gasoline 18–26 ton 20	1,400	467	117.00
Crawler diesel 14–19 ton 12	800	267	62.00
Crawler diesel 18–26 ton 20	1,700	567	142.00
Crawler diesel 14–20 ton 45	2,725	908	227.00
Crawler steam 18–24 ton 12	725	242	60.00
Locomotive gas 27–32 ton 12	1,300	430	108.00
Locomotive steam 27–32 ton 12	1,180	393	98.00
Truck-mounted gas 7–9 ton 10 (per hour $10)	700	230	58.00
Truck-mounted gas 12–20 ton 10 (per hr. $17.50)	925	300	77.00
Crushers (without accessories or power)			
Openings 9x16	85	28	7.00
Openings 10x30	190	63	16.00
Openings 12x36	265	88	22.00
Derricks			
Stiff-leg wood 3½–4½ ton	100	33	8.50
Stiff-leg 4–6 ton 50–80 ft. boom	215	72	18.00
Stiff-leg 13–17 ton 70–100 ft. boom	390	130	33.00
Stiff-leg 32–42 ton 70–100 ft. boom	555	185	46.00
Guy 13–17 ton 70–110 ft. boom	245	82	20.00
Guy 35–45 ton 100-120 ft. boom	450	150	37.00
Engines			
Gasoline with clutch 22–30 hp	50	17	4.50
Gasoline with clutch 55-70 hp	90	30	7.50
Diesel with clutch 22–30 hp	75	25	6.50
Diesel with clutch 55–70 hp	135	45	11.00
Diesel with clutch 90–115 hp	245	82	20.00
Finegraders 11-16 ft. width	510	170	42.00
Finishing machines			
Concrete-floor (powered)	60	20	5.00
Road finishers 12–18 ft. roadway	394	131	33.00
Road finishers 24–30 ft. roadway	495	165	41.00
Bituminous machines	750	250	63.00
Graders			
Single drive—8,600 to 14,000 lb. gasoline	275	92	23.00
Tandem drive 19,000–21,000 lb. gasoline	470	156	39.00
Tandem drive 18,500–21,000 lb. diesel	525	173	42.00
Towed-power operated 9-11 ft	190	63	15.75
Pile hammers			
Drop 1,500–2,250 lb.	20	7	2.00
McKiernan-Terry #2	70	20	5.00
McKiernan-Terry #7	135	45	11.00

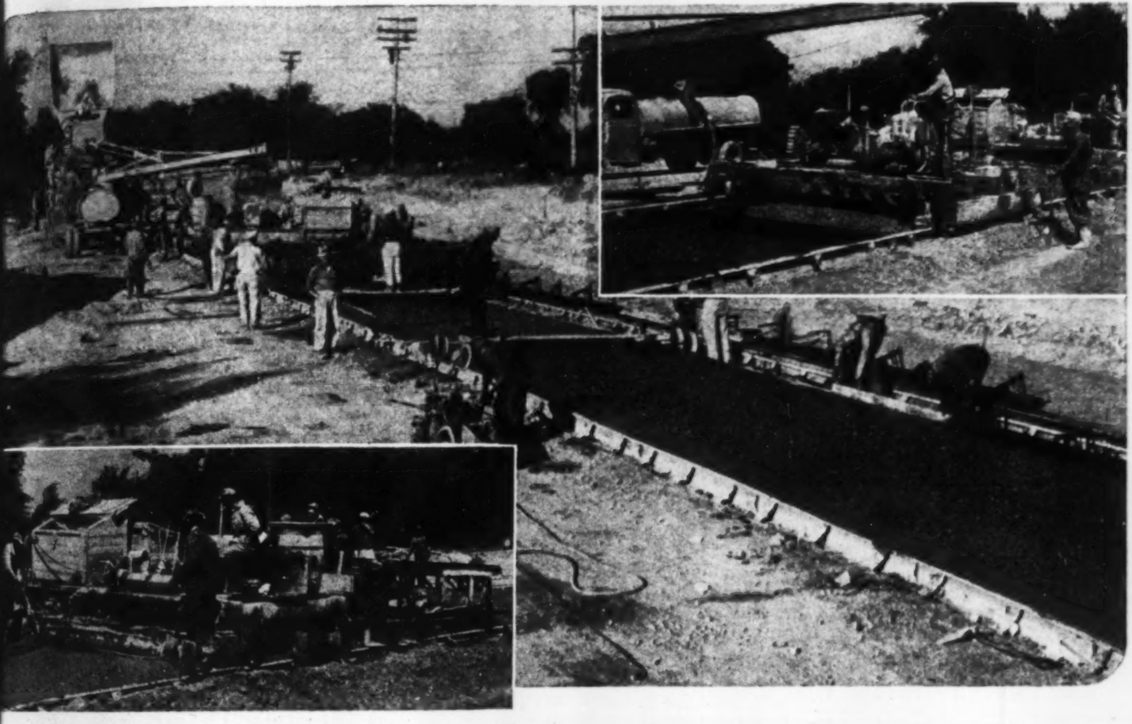
	Per Month	Per Week	Pe Da
Pile Hammers (Cont'd)			
McKiernan-Terry #10B2 or 3	$270	$90	$22.
Vulcan #1	204	68	17.
Vulcan #00	350	115	30.
Vulcan Pile Extractor #800	240	80	20.
Tank Car Heater 2–3 car capacity	210	75	20.
Hoists			
Gasoline single-drum 29–42 hp	95	32	8.
Gasoline double-drum 22–28 hp	100	33	8.
Gasoline double-drum 55–65 hp	175	58	15.
Electric single-drum 17–27 hp	75	25	6.
Electric double-drum 37–47 hp	138	46	11.
Air 1,500–2,500 lb.	65	22	5.
Chain 1½–2½ ton	20	7	2.
Chain 4–6½ ton	30	10	2.
Mixers, Bituminous			
Central Plant 30–50 ton per hr. (gradation control)	1,573	524	131.
Central Plant 70–90 ton per hr. (gradation control)	2,217	739	185.
Traveling Plant 1¼–1¾ cu. yd. per min	1,085	362	90.
Mixers, Concrete			
Power charger 6S to 8½S	85	28	7.
Power charger 12S to 16S	155	52	13.
Batch hopper 25S to 30S	210	70	17.
Paver 24 to 30 cu. ft	785	295	74.
Paver 30 to 37 cu. ft	1,335	444	111.
Pumpcrete (concrete pump)			
Model 160 single cylinder	465	155	39.
Model 200 double cylinder	1,065	355	90.
Pumps			
Centrifugal, gasoline, 2 in. 7 to 10 M	40	13	3.
Centrifugal, gasoline, 4 in. 30 to 40 M	80	27	7.
Centrifugal, gasoline, 8 in. 125 M	195	65	16.
Diaphragm force or open 3 in. double	50	17	5.
Diaphragm force or open 4 in. double	60	20	5.
Rollers			
Two-wheel tandem 5–9½ ton gasoline	250	83	21.
Two-wheel tandem 12½–17½ ton gasoline	325	108	27.
Three-wheel 5½–6½ ton gasoline	200	67	16.
Three-wheel 7½–9 ton gasoline	270	90	22.
Three-wheel 11–13 ton gasoline	425	142	35.
Sheepsfoot, double drum	90	30	7.
Sheepsfoot, triple drum	175	58	15.
Shovels and back-hoes (dipper included)			
Crawler, gasoline ⅜ cu. yd	440	147	37.
Crawler, gasoline ¾ cu. yd	605	201	50.
Crawler, gasoline 1¼ cu. yd	880	293	73.
Crawler, diesel ¾ cu. yd	715	238	60.
Crawler, diesel 1¼ cu. yd	1,045	348	87.
Crawler, diesel 2 cu. yd	1,980	660	165.
Surveying instruments			
Levels	15	5	1.
Transits	20	7	1.
Tractor, crawler, and attachments			
33–41 hp. gasoline	265	88	22.
66–85 hp. gasoline	425	142	35.
46–52 hp. diesel	410	137	34.
72–89 hp. diesel	645	215	54.
89–135 hp. diesel	775	258	65.
Winch, any size, double drum	75	25	6.
Bulldozer 66–89 hp. tractor	120	40	10.
Angledozer 66–89 hp. tractor	148	49	12.
Tractors-wheeled			
4 wheel, rubber tired diesel 93–103 hp	530	175	45.
4 wheel, rubber tired diesel 140–160 hp	855	285	70.
2 wheel rubber tired diesel 145–160 hp	780	260	65.
2 wheel rubber tired diesel 195–210 hp	1,385	461	115.
Scrapers and Wagons (heaped measure)			
Scraper 7–10 cu. yd	250	85	21.
Scraper 17–22 cu. yd	575	190	48.
Scraper 29–37 cu. yd	1,025	340	85.
Crawler wagons, bottom dump 9½–12½ cu. yd.	240	80	20.
Crawler wagons, bottom dump 14½–20½ cu. yd.	370	123	31.
Vibrators, gasoline, flexible shaft			
Up to 1⅙ hp. 23 ft. shafting	40	13	3.
2½–4 hp	60	20	5.
Welding Machines, wheels or skids			
Gasoline-engine driven up to 250 amp	74	25	6.
Gasoline-engine driven 350 to 500 amp	114	38	9.
60 cycle motor driven up to 250 amp	35	12	3.
60 cycle motor driven 350 to 500 amp	56	19	4.

ir Entraining Cement

EEDS QUICK FINISHING BEHIND 4E DUAL DRUM PAVER . . . .

describing the problem of the rvitz Company in laying 7,000 sq. yds. of resin-content r-entraining cement, which creases durability and resists ling, on Ohio Route 237 outside Cleveland, "Construction Methods" states:

"Mixing of the concrete introduced no complications . . . Of more immediate importance to the contractor, the air-entraining cement produced a concrete which was almost free from surface bleeding, thus providing little water for lubrication during finishing. It was necessary to finish the concrete promptly, before the surface would become too dry, and this fact caused the finishers to work closely behind the mixer, avoiding long overtime at the end of the day and permitting the curing compound to be applied early to the slab. Prompt finishing was of particular advantage in the cool fall days."



HIS JAEGER SPREADER-FINISHER TEAM EASILY DID THE JOB

nners of post-war highway projects, d contractors who will execute them, e recognize that such developments the dual-drum paver, the extensive of low slump vibratory mixes and, y, the use of plastic air entraining ent, are possible because of Jaeger's r development of the mechanical ader and finisher — *the team that e the bottleneck behind the paver.*

has been done on many war-time orts (where one Jaeger paving team often handled the output of two 34E l drum pavers) contractors will figtomorrow's projects on the basis of *ost unlimited spreading and finishing city*, regardless of width and thicks of slab or characteristics of the mix.

Also Improves the Pavement

r and above this enormous increase capacity and flexibility of operation been the improvement in strength smoothness of the slab produced screw spreading (which eliminates regation and gives a uniformly dense texture) and by the use of the Jaeger Finisher behind the Spreader, where it need only concern itself with producing an accurately finished surface.

More Years of Service

Mechanical excellence is in keeping with performance. As a typical example, at Maxwell Field, Alabama, a Jaeger Finisher operated by R. H. Wright & Son completed over 1,000,000 sq. yds. of pavement with its first set of screed shoes and not a single important repair. In over 100 cities you will find a Jaeger distributor who has the knowledge of latest equipment, methods and local conditions needed to help you plan and bid. Today he can repair your present equipment and rent you additional machines. Tomorrow, he will be ready to supply you with advanced models of any Jaeger equipment listed below.

THE JAEGER MACHINE COMPANY

200 Dublin Avenue **Columbus 16, Ohio**

JAEGER *Engineered* EQUIPMENT

ALSO "SPEEDLINE" MIXERS, "SURE-PRIME" PUMPS, "DUAL-MIX" TRUCK MIXERS,
JAEGER HOISTS, "FLEET-FOOT" CRANE-LOADERS,
"AIR-PLUS" PORTABLE COMPRESSORS

Cost of Financing

COST OF CONSTRUCTION money in 1943, as measured by yields of high-grade bonds, averaged the lowest ever reported for municipal, U. S. treasury, public utility and railroad bonds. Industrial bond yields were above 1941 and 1942, but below all other years. Municipal bond yields declined 13 percent from the 1942 average; treasury bonds were 5 percent lower; railroad bonds were down 2 percent; and public utilities were off 3 percent. Industrial yield average increased 0.4 percent.

The 1943 annual average yields for the various types of high-grade bonds in percent were: municipal, 2.06; U. S. treasury, 1.91; industrial, 2.55; public utility, 2.63; railroad, 3.10.

In the opening two months of 1944 bond yields continued to decline from their year-end values. They were lower for all types reported above, except for U. S. treasury bonds, which were unchanged from December. The February values for municipals, industrials, public utilities and railroads were 1.85, 2.58, 2.66, and 3.07, in that order.

Commercial loan rates, or averages of rates charged by banks in principal cities, averaged 2.72 percent for the nineteen reporting cities in 1943, up 4 percent compared with 1942. The New York City average rate, 2.30 percent, compared with 2.07 in the preceding year. Seven northern and eastern cities averaged a rate of 2.80 percent for 1943, as against 2.58 a year ago; and eleven southern and western cities reported an average of 3.13 percent in 1943, as compared with 3.26 in 1942.

The 1943 fourth quarter average for the nineteen cities stood at 2.65, an increase of 0.8 percent over the 1942 fourth-quarter.

Bond Yields—Percent

	U. S. Treas. (1)	Municipal (2)	Industrial (3)	Pub. Util. (4)	Railroad (5)
1933	3.31	4.71	4.98	4.69	4.55
1934	3.12	4.03	4.28	4.19	4.01
1935	2.79	3.41	3.73	3.59	3.58
1936	2.65	3.07	3.34	3.38	3.31
1937	2.68	3.10	3.16	3.22	3.45
1938	2.56	2.91	2.82	2.99	3.60
1939	2.36	2.76	2.64	2.83	3.39
1940	2.21	2.50	2.57	2.75	3.26
1941	1.95	2.10	2.50	2.69	3.16
1942	2.02	2.36	2.54	2.71	3.17
1943	1.91	2.06	2.55	2.63	3.10
1943 Jan.	2.06	2.27	2.55	2.68	3.15
Feb.	2.06	2.22	2.55	2.65	3.12
Mar.	2.08	2.21	2.56	2.66	3.13
Apr.	2.02	2.20	2.57	2.66	3.12
May	1.92	2.13	2.55	2.65	3.10
June	1.85	2.07	2.53	2.62	3.10
July	1.82	1.97	2.49	2.58	3.10
Aug.	1.83	1.91	2.51	2.59	3.07
Sept.	1.80	1.92	2.53	2.59	3.06
Oct.	1.81	1.88	2.53	2.61	3.07
Nov.	1.85	1.90	2.57	2.64	3.08
Dec.	1.86	2.00	2.60	2.68	3.10
1944 Jan.	1.86	1.92	2.54	2.67	3.07
Feb.	1.84	1.85	2.58	2.66	3.07
Mar.	....	1.84	2.59	2.65	3.06

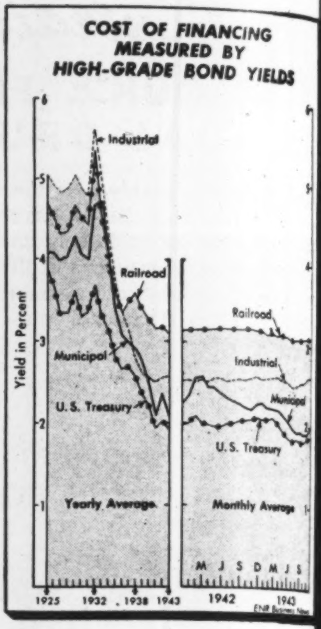
(1) Aver. all U. S. Treasury Bonds except those due or callable within 12 years; 1942 and 1943 data for partially tax exempt issues.

(2) Standard Statistics & Poors — aver. 15 high-grade long-term municipals.

(3) Standard Statistics & Poors — aver. A1 plus industrials.

(4) Standard Statistics & Poors — aver. A1 plus public utilities.

(5) Standard Statistics & Poors — aver. A1 plus railroads.


COST OF FINANCING MEASURED BY HIGH-GRADE BOND YIELDS

Rate of Interest*

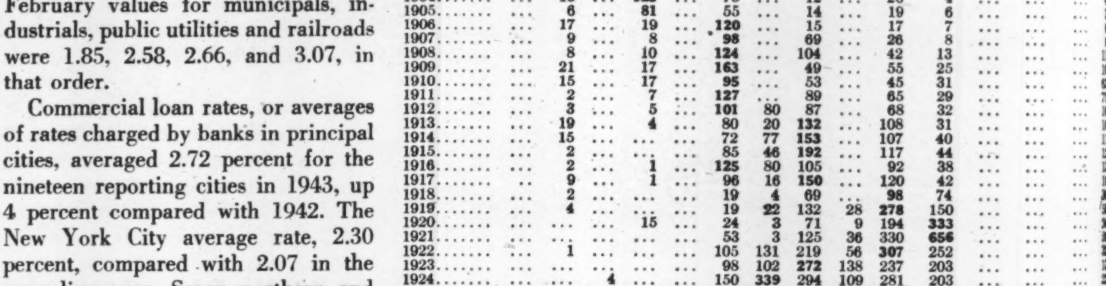
Municipal Bond Sales in the U. S. from Commercial & Financial Chronicle

(Millions of Dollars — 000,000 Omitted)

Year	2%	3%	3¼%	3½%	3¾%	4%	4¼%	4½%	4¾%	5%	5½%	5¼%	5¾%	6% & over
1901	...	11	...	**69**	...	28	...	5	...	9		...	...	...
1902	...	12	...	**77**	...	34	...	4	...	10	2	...	...	...
1903	...	17	...	**55**	...	47	...	9	...	14	5	...	...	...
1904	...	13	...	**123**	...	75	...	12	...	20	4	...	...	...
1905	...	6	...	**81**	...	55	...	14	...	19	6	...	...	...
1906	...	17	...	19	...	**120**	...	15	...	17	7	...	...	...
1907	...	9	...	8	...	**98**	...	69	...	26	8	...	...	...
1908	...	8	...	10	...	**124**	...	104	...	42	13	...	...	...
1909	...	21	...	17	...	**163**	...	49	...	55	25	...	...	...
1910	...	15	...	17	...	**95**	...	53	...	45	31	...	...	...
1911	...	2	...	7	...	**127**	...	89	...	65	29	...	...	...
1912	...	3	...	5	...	**101**	80	87	...	68	32	...	...	...
1913	...	19	...	4	...	80	20	**132**	...	108	31	...	...	...
1914	...	15	...	...	...	72	77	**153**	...	107	40	...	...	...
1915	...	2	...	...	...	85	46	**192**	...	117	44	...	...	...
1916	...	2	...	1	...	**125**	80	105	...	92	38	...	...	...
1917	..	9	...	1	...	96	16	**150**	...	120	42	...	...	...
1918	...	2	...	...	...	19	4	69	...	**98**	74	...	...	...
1919	...	4	...	...	...	19	22	132	28	**278**	150	...	...	...
1920	...	...	...	15	...	24	3	71	9	194	**333**	...	...	...
1921	...	...	...	...	...	53	3	125	36	330	**656**	...	...	...
1922	...	1	...	...	...	105	131	219	56	**307**	252	...	...	...
1923	...	...	...	...	...	98	102	**272**	138	237	203	...	...	...
1924	...	...	4	...	...	150	**339**	294	109	281	203	...	...	...
1925	...	...	1	...	...	270	302	**314**	76	202	201	...	...	...
1926	...	...	...	...	...	212	287	**342**	76	215	199	...	...	...
1927	...	16	10	...	...	**361**	321	336	79	180	160	...	...	...
1928	...	...	37	...	...	365	**384**	281	68	150	111	...	...	...
1929	...	3	65	...	...	107	133	**449**	132	250	281	...	...	...
1930	...	2	60	...	...	338	326	**341**	150	155	97	...	...	...
1931	...	92	...	181	...	241	**311**	197	51	99	77	...	...	...
1932	...	31	...	19	...	68	56	151	73	122	**322**	...	...	...
1933	...	32	15	29	39	**131**	48	51	22	61	3	20	3	52
1934	84	107	94	54	72	**197**	54	75	41	88	13	23	4	13
1935	161	**349**	62	137	71	234	40	50	22	26	3	3	2	9
1936	211	**343**	71	156	35	212	14	23	3	16	1	1	...	2
1937	73	**422**	55	95	50	134	26	13	3	7	1	1	...	1
1938	**360**	256	105	102	54	149	21	11	8	8	3	...	1	1
1939	**446**	282	80	58	30	128	71	8	2	4	...	1	...	1
1940	**437**	**446**	84	80	55	90	16	8	1	2	...	...	...	1
1941	**450**	214	120	48	27	53	6	3	2	2	...	...	...	...

Bold face type indicates interest rates on which bulk of financing was done for year.

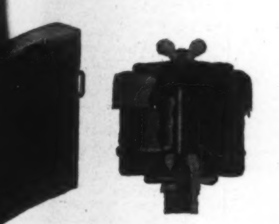
* Temporarily discontinued by reporting source.



AIR IS CHEAP...or is it?

★

E RIGHT FILTER
THE RIGHT PLACE



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OPA Price Regulations Affecting Construction

(As revised or amended since April 1, 1943, and supplementing digest published April 22, 1943)

MPR No.	Items Covered	Date Effective	Purpose
6.	IRON AND STEEL PRODUCTS		
13.	DOUGLAS FIR PLYWOOD (2nd Revision)	Sept. 27, 1943	New grades and grading terms: Seattle base on inbound transportation costs. arbitrary freight rate for Wash. and Ore.: additions for longer lengths.
19.	SOUTHERN PINE LUMBER (2nd Revision)	Feb. 4, 1944	New ceiling set: defines transactions, products and persons covered: lists maximum prices and terms of sale.
	(Amend. 1)	Feb. 26, 1944	Treatment by spraying (except of timbers) does not entitle seller to addition.
	(Amend. 2)	Mar. 16, 1944	Certain mills exempted, but subject to MPR-19A: "F.o.b. mill" defined. Virginia produced pine ceiling raised for some sizes: ruling on combination grades.
26.	DOUGLAS FIR LUMBER (Revision) (Incl. Amend. 5)	June 9, 1943	Sellers not previosly subject must apply for proposed price or sell at $15 per M ft. Limited additions for scaffold planking: additions for certain surfacing operations: rough lumber sizes defined.
40.	BUILDERS' HARDWARE (Amend. 1)	Oct. 21, 1942	Amendments to enforcement and licensing provisions.
	(Amend. 2)		Price determination by 4 methods to cover larger groups of manufacturers.
	(Amend. 3)		Pad ock ceiling prices raised.
44.	DOUGLAS FIR DOORS (Rev.—Amend. 1)	Oct. 6, 1942	Higher transportation costs may be included in selling price.
	(Amend. 2)	Oct. 2, 1943	Producer price level increased 8.9%: jobber and retailer sales included.
	(Amend. 3)		Method of jobbers passing on increase established.
46.	RAILROAD RAIL, RELAYING (Revision)	May 1, 1943	Used track accessories priced 10 to 30% under mill price of new items: warehouse price for rail over 60-lb. $3.84 per ton, carlots.
49.	RESALE OF IRON AND STEEL PRODUCTS (Revision)	April 15, 1943	Extra charges on alloy steels developed for war use may be made for tests and treatment.
	(Amend. 14)	April 15, 1943	Dollars and cents prices for prime quality products in 14 eastern states.
	(Amend. 15)	June 21, 1943	Second and reject classes of galv. sheets have price increased.
	(Amend. 16)	June 21, 1943	Dollars and cents prices for prime quality products extended to more areas.
	(Amend. 17)	July 20, 1943	Special delivery charges may be passed on to buyer: normal freight must be deducted from price.
	(Amend. 18)	Nov. 1, 1943	Dollars and cents prices for prime products set for South and West Coast.
	(Amend. 19)	Nov. 1, 1943	Deliveries to points outside "rail price area": method of computing.
	(Amend. 20)	Jan. 13, 1944	Penalties for evasion amended: records, reports, invoices required.
82.	WIRE, CABLE AND CABLE ACCESSORIES (Revision Incl. Amend. 2)	July 22, 1942	Scope broadened to include wholesalers as well as manufacturers: sales under experimental and secret war contracts exempt: government purchases under emergency conditions also exempt.
	(Amend. 3)	May 8, 1943	Rubber-covered wire and cable higher.
	(Amend. 4)	Aug. 4, 1943	Individual price adjustments to cases qualifying.
	(Amend. 6)	Mar. 18, 1944	Prices for supplies and sale of services set at Oct. 15, 1941 level.
	(Amend. 7)	Mar. 21, 1944	Maximum prices held to 120% of manufacturers net prices.
88.	PETROLEUM AND PETROLEUM PRODUCTS (Revision)	Feb. 19, 1944	Fuel oil, gasoline and liquefied petroleum gas prices set: standards and specifications as in general use.
94.	WESTERN PINE LUMBER (Revision)	Dec. 29, 1942	Prices set extending to secondary species: also pine imported from Mexico and Canada.
	(Amend. 1)	April 5, 1943	Geographical scope broadered: green lumber pricing methods: "fringe" mills: private trucking allowances.
	(Amend. 2)	May 31, 1943	Price increase of $3 per Mft. if certain conditions are met.
	(Amend. 3)	June 16, 1943	Overlapping of types eliminated.
	(Amend. 5)	Aug. 13, 1943	Alaskan lumber for delivery outside U. S. brought under ceiling.
	(Amend. 6)	Sept. 7, 1943	Aris. and N. Mex. producers allowed rise of $3 per Mft. for certain grades.
	(Amend. 7)	Sept. 9, 1943	$3.00 increase in "inch-shop" lumber.
	(Amend. 8)	Sept. 25, 1943	Defense Supplies Corp. authorised to sell Mexican pine at highest price established for private importers.
	(Amend. 9)	Dec. 4, 1943	Price increased $3.00 in 12 states on 12 specific grades of lumber.
	(Amend. 10)	Jan. 10, 1944	Pricing methods and basing points for "fringe area", Canada and Mexico.
	(Amend. 11)	Jan. 19, 1944	Fence lath prices increased $1 per M.
	(Amend. 12)	Jan. 29, 1944	Mills to compute freight charges on commercial and gov't. bills of lading in same manner.
97.	SOUTHERN HARDWOOD LUMBER (Amend. 9)	Oct. 11, 1943	Ceilings increased on 1 to 2-in. stocks on plain red and white oak lumber.
	(Amend. 10)	Nov. 15, 1943	Price changes on mixed hardwoods.
	(Amend. 11)	Jan. 3, 1944	Additions for trucking in special cases.
134.	CONSTRUCTION AND ROAD EQUIPMENT RENTAL (Amend. 1-9)	May 11, 1942	Rental rates on construction equip as of July 1, 1943.
	(Amend. 14)	Feb. 5, 1944	Dump-truck rental on fully-oper basis computed on actual hourly
136.	MACHINES AND PARTS, AND MACHINERY SERVICES (Amend. 106)	Nov. 26, 1943	Collation or regulation, including amendments since originally issued. Includes index.
	(Amend. 108)	Feb. 26, 1944	Emergency service charges.
	(Amend. 109)	Feb. 23, 1944	Rules governing sales by gov't. or for sale for benefit of where government is biggest
	(Amend. 110)	Mar. 18, 1944	Prices set on metal stampings.
	(Amend. 112)	Mar. 27, 1944	Permits automatic adjustment for other than manufacturers.
	(Amend. 111)	Mar. 27, 1944	Sales of used equipment by War, Depts. or Defense Plant Corp.
146.	APPALACHIAN HARDWOOD LUMBER (Amend. 12)	April 29, 1943	Adds cost for custom kiln-drying milling.
	(Amend. 13)	Nov. 6, 1943	Price changes in mixed hardwoods.
	(Amend. 16)	Dec. 29, 1943	Max. prices for freight car stock.
155.	CENTRAL HARDWOOD LUMBER (Amend. 8)	Sept. 28, 1943	Max. prices set in Kentucky and nesee portions of Central area.
	(Amend. 9)	Oct. 20, 1943	Price increase $1 to $10 on grades, South Central region.
	(Amend. 10)	Nov. 15, 1943	Uniform prices for No. 1 and 2 dim mixed hardwoods.
	(Amend. 11)	Dec. 17, 1943	Price rise of $8.75 in North region.
206.	VITRIFIED CLAY PIPE AND ALLIED PRODUCTS	Oct. 25, 1943	All manufacturers under single
	(Revision) (Amend. 1)	Dec. 24, 1943	Shortages in some regions allow freight charges to aid in overcoming
216.	EASTERN POLES AND PILING (2nd Revision)	Sept. 27, 1943	Specific maximum prices set: under GMPR: set at Mar. '42 Railroad ties included.
	(Amend. 1)	Dec. 4, 1943	"Normal loading-out point" defined ties: buying poles for conversion use prohibited: zoning and basing changes.
	(Amend. 2)	Feb. 8, 1944	Producers' ceilings established on basis for industrial blocking: increased $1.50 in north.
	(Amend. 3)	Mar. 31, 1944	Winds up pre-existing contracts 60 days after effective date.
219.	NORTHEASTERN SOFTWOOD LUMBER (2nd Revision)	Feb. 17, 1944	Increase in mill ceiling price: pricing procedure.
222.	NORTHERN SOFTWOOD LUMBER (2nd Revision)	Oct. 15, 1943	Increased ceilings 14.5% to for higher wages.
	(Amend. 1)	Jan. 19, 1944	Lath prices increased.
223.	NORTHERN HARDWOOD LUMBER (Amend. 4)	April 29, 1943	Adds cost of custom kiln-drying milling.
	(Amend. 5)	May 4, 1943	Beech lumber ceilings set: hearts" raised: provisions for hardwoods": "barkies", and quantities. Addition for and certain No. 3 common widths.
	(Amend. 6)	July 3, 1943	Additional grades and items covered.
	(Amend. 7)	Aug. 10, 1943	Basic mill price rise authorized.
	(Amend. 8)	Oct. 15, 1943	Price changes various kinds of lumber.
	(Amend. 9)	Nov. 8, 1943	Truck haul added only in case of abandonment.
	(Amend. 10)	Jan. 3, 1944	Deductions for mixed hardwoods lumber, trucking to railhead Special "non-standard" grades cluded.
	(Amend. 11)	Jan. 19, 1944	No. 1 snow fence lath increased $1.
224.	CEMENT (Amend. 2)	Nov. 4, 1942	Method of applying for adjustment government contracts.
	(Amend. 3)	June 21, 1943	Alternate method of pricing to war curement agencies extended.
	(Amend. 4)	Jan. 11, 1944	Prices for sales to exporters.
	(Amend. 5)	Jan. 18, 1944	Sales out of normal market area required to be reported.
251.	CONSTRUCTION AND MAINTENANCE SERVICES, ETC. (Amend. 2)	July 12, 1943	Individual adjustments in local on remaining items under regulatory action planned to for MPR-251 control.
253.	REDWOOD LUMBER AND MILLWORK (Amend. 2)	April 5, 1943	Average price on cooling tower
	(Amend. 3)	April 14, 1943	Application for adjustment in provided in Rev. Procedural No. 1.
	(Amend. 4)	June 2, 1943	Differential between dry and green bers.
	(Amend. 5)	Aug. 17, 1943	Reports on "dry" and "partially lumber no longer required days.
272.	CAST IRON BOILERS AND RADIATORS (Amend. 2)	May 19, 1943	Delivery charge practice restored force by manufacturer Oct. 1,
	(Amend. 3)	Oct. 9, 1943	Increase of 3c. per ft. for radiators.
	(Amend. 4)	Feb. 28, 1944	C. I. boilers increased 10½ percent.
276.	ASPHALT TILE (Amend. 2)	Sept. 7, 1943	Changes in style or quality must be ported.
	(Amend. 3)	Dec. 9, 1943	Max. prices on asphalt floor tile greaseproof asphalt tile.

(Continued on page 146)

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RTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
TCH TYPE ASPHALT PLANTS
VELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
RACTOR-CRUSHER PLANTS
EEL TRUCKS AND TRAILERS
XUBIT IMPACT BREAKERS

Miscellaneous Building Costs

FACTORY BUILDING, CLEVELAND, OHIO—Typical one-story 200x244¾-ft. industrial plant, welded, rigid-frame construction, wood purlins.

Total cost of building was $2.21 per sq. ft. including all mechanical trades and sprinkler system extensions from neighboring building. Contract awarded December, 1940. (*ENR*, Nov. 19, 1942; p. 700.)

Arc-welded rigid frames on 20-ft. centers composed of six spans 33-ft. 10-in. and one span 39-ft. 2-in. In spans, wide-flange sections are used for both beams and columns. Rafter knees are welded plates of same thickness as webs and flanges of beams. Foundations on spread footings. Column bases embedded in reinforced concrete floor slab, assuring fixed-end conditions for framework. Outside walls 13-in. brick masonry; roof construction is 6x12-in. wood purlins on 7-ft. centers covered by 2-in. planking and 4-ply asphalt covering.

WAREHOUSE BUILDINGS — Fourteen warehouse buildings designed with steel truss roofs, received alternate bids on concrete structures of same size, volume and capacity, and with equivalent light and ventilation. Jacob Held, consulting engineer, New York, N. Y., prepared a flat-slab co roof design, which his client, & Fuhrman, Inc., estimated at $ per sq. ft. compared with $2.28 the barrel-arch roof design, $2.168 for the standard steel de Comparisons shown in the ac panying table were based on rates prevailing in Georgia, Febr 1941, and were discussed by th thor in *ENR*, Oct. 21, 1943, on 637.

COMPARISON OF SQUARE FOOT COSTS OF THREE TYPES OF WAREHO IN DOLLARS, INCLUDING ALL SITE WORK:

Bidder	Standard steel design	Barrel arch design	Flat slab de
A	2.065	.....	.....
B	2.225	2.126	.....
C	2.168	2.282	2.134

The comparison of unit costs per sq. ft. for the two concrete designs (as estimated by bidder C

Item	Barrel arch design	Flat slab de
Excavation	0.063	0.069
Electrical and mechanical	0.817	0.815
Foundations, etc	0.482	0.505
Superstructure	0.920	0.745

The proposed flat-slab design required the least amount of steel, as is shown by the comparison three designs:

Item	Standard steel	Barrel arch	Flat slab
Structural	10,866 ton	300 ton	300 ton
Floor mesh	720 ton	720 ton	720 ton
Reinforcing	1,470 ton	7,175 ton	6,405 ton
Totals	13,056 tons	8,195 tons	7,425 tons
Per sq. ft	12.50 lbs.	7.85 lbs.	7.10 lbs.
	176%	110%	100%

OPA Price Regulations Affecting Construction

(*Continued from page 144*)

MPR No.	Items Covered	Date Effective	Purpose
290.	Sitka Spruce Lumber (Amend. 2)	May 29, 1943	Differential between boards and box lumber narrowed.
293.	Stock Millwork—Softwood Lumber Products (Revision)	Sept. 21, 1943	Discounts shortened to pass along increased lumber costs: jobbers and distributors permitted to increase prices: extra charge for special services. Covers southern pine glazed windows: regional pricing.
	(Amend. 1)	Oct. 26, 1943	Ceiling increased 3% on specialities.
	(Amend. 2)	Oct. 26, 1943	Jobbers prices up 3% on specialties.
	(Amend. 3)	Dec. 4, 1943	Prices rounded off to nearest cent (mfr.).
310.	Reusable Structural Steel Shapes and Plates, and Shafting (Amend. 1)	May 8, 1943	Salvaged assemblies included: complete structures not included: "services" defined and rate charge set: detailed invoices not required under $1 sale.
317.	Locks and Lock Sets — Building Materials (Amend. 1)	May 19, 1943	Sales to industrial and commercial users classified as retail, conforming to manufacturers previous practice.
	(Amend. 2)	Sept. 28, 1943	Prices set on iron, steel, plastic lines.
323.	Asphalt and Asphalt Products (Amend. 7)	Mar. 6, 1944	New reference point: light saturants sold in Calif. area: covers manufacturers who purchase in bulk for package resale: higher mark-up allowed where customary.
324.	Fence Posts (Revision)	July 2, 1943	Prices for all principal species: method of pricing unlisted posts.
	(Amend. 1)	July 30, 1943	Red cedar posts produced in Mo., La., Okla. to use Ark. max. prices: base, Flippen, Ark.
	(Amend. 2)	Feb. 5, 1944	Distributor sales to retail yard covered: retail yard sales: pressure treating.
354.	Copper Sulphate	April 3, 1943	Maximum base price $5.00 per 100-lb.
	(Amend. 1)	May 3, 1943	Freight rate charges equalized.
	(Amend. 2)	May 7, 1943	Distributors may charge retail ceilings if less than 300-lb. and for farmers.
	(Amend. 3)	June 14, 1943	Non-farm use price ceilings set.
	(Amend. 4)	Aug. 18, 1943	Western territory delivered prices set.
368.	Northeastern Hardwood Lumber	April 21, 1943	Lumber produced in New England and Middle Atlantic states under ceiling.
	(Amend. 1)	June 24, 1943	Green lumber sellers deduct 10% from price.
	(Amend. 2)	Aug. 4, 1943	Canadian lumber on f.o.b. mill basis.
	(Amend. 3)	Nov. 22, 1943	Mixed hardwood dunnage up $12 to $20.
	(Amend. 4)	Dec. 18, 1943	Ceilings on N.E. turning squares revoked.
	(Amend. 5)	Jan. 3, 1944	Five specified regions now under ceiling.
	(Amend. 6)	Feb. 5, 1944	Price increase of 6% on most products: ceiling revoked on industrial blocking.
369.	Dry Roofing and Flooring Felt (Revision)	Dec. 6, 1943	Ceiling set at Mar. 1942 lev prices quoted in regulation.
402.	Western Red Cedar Lumber	June 12, 1943	Dollars and cents ceiling at M levels.
411.	Reusable Steel Storage Tanks (Field Assembled)	July 2, 1943	Ceiling set for tanks of various ca kinds. Dismantling, cleaning ances.
412.	Tidewater Red Cypress	June 29, 1943	Price at Mar. 1942 level, plus $1. in La. where $1.50 is allowed.
	(Amend. 1)	Sept. 11, 1943	Producers to get registration nu
413.	Hinges and Butt Hinges	July 3, 1943	Reduces manufacturers price 2 sets price for jobber sales and f ers of locks and lock sets.
	(Amend. 1)	July 20, 1943	Manufacturers shipments into Nebr., N. D., and S. D. to b
	(Amend. 2)	Sept. 20, 1943	Jobbers in Zone 2 to use custom of billing.
	(Amend. 3)	Dec. 13, 1943	5% increase in mfr. and jobbers retail price unchanged.
432.	Maple, Birch and Beech Flooring	July 24, 1943	Ceiling set 7% above Mar. 194 quantity differentials for sma
	(Amend. 1)	Sept. 8, 1943	10% rise for mills in Mich., Wa
	(Amend. 2)	Jan. 8, 1944	Expanded to include all Northe wood flooring.
458.	Oak Flooring and Pecan Flooring	Aug. 28, 1943	Ceilings at Mar. 1942 levels.
	(Amend. 1)	Nov. 4, 1943	Oak flooring up 24%; pecan, 21
	(Amend. 2)	Jan. 17, 1944	Beech flooring produced in Sout Central and Appalachian ar
460.	Western Timber	Aug. 31, 1943	Method of computing maxim on ceilings: persons and tra covered.
466.	Asbestos-Cement Building Materials	Sept. 18, 1943	Maintains current price levels formula method of price deter Corrugated sheets reduced.
	(Amend. 1)	Sept. 18, 1943	Conforming to established practi fies transportation charges.
467.	Distribution Yard Sales of Hardwood Lumber	Sept. 20, 1943	Methods of pricing: basing p at Mar. '42.
	(Amend. 1)	Nov. 24, 1943	Nashville basing point for aro cedar.
	(Amend. 2)	Jan. 20, 1944	Reduction in charge for rough, common lumber of specified gr
491.	Pressure Preservative Treatment of Forest Products and Pressure Treated Forest Products	Nov. 19, 1943	Dollars and cents ceilings for se pressure treating railroad ties, piling, poles, etc. Average 1942 prices. Allowances special services.

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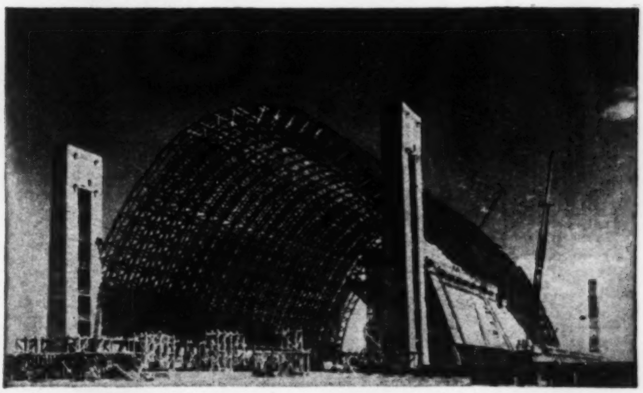
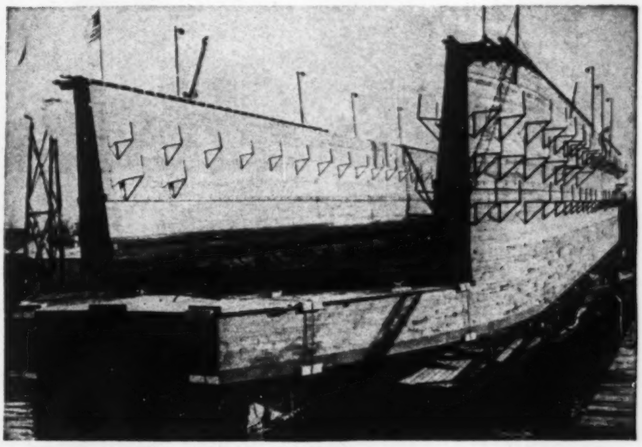

Blimp Dock. The world's largest clear span timber structure recently completed by the Navy. 1000 feet long, 153 feet high, clear spanning 237 feet.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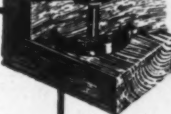

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Depreciation Schedule—U. S. Bureau of Internal Revenu

In January 1942 the U. S. Bureau of Internal Revenue revised its 1931 schedule of probable useful life and depreciation rates. Items of direct interest to civil engineers and contractors are shown in revised Schedule "F", and include those quoted in the following list. The schedule reveals the probable useful life in years. Annual depreciation rates are not given, inasmuch as they are considered to be on a straight-line basis. For example, on an item having a probable useful life of ten years, the annual depreciation rate is 10 percent; for an item having a probable useful life of 25 years, the annual depreciation rate is 4 percent, etc.

BUILDINGS

	Est. Total Life, Years	Composite rate (percent)		
		Type of construction		
		Good	Average	Cheap
Apartments	50	2½	2½	3
Banks	67	2	2	2½
Dwellings	60	2	2½	3
Factories	50	2¼	2½	3
Farm buildings	60	2	2	2½
Garages	60	2	2½	3
Grain elevators	75	1½	2	2½
Hotels	50	2½	2½	3
Loft buildings	67	2	2	3
Machine shops	60	2	2½	3
Office buildings	67	2	2½	3
Stores	67	2	2	2½
Theaters	50	2½	3	3½
Warehouses	75	1½	2	2½

BUILDING EQUIPMENT

	Years
Air conditioning:	
Air conditioning systems—	
Large—over 20 tons	20
Medium—5 to 15 tons	15
Small—under 5 tons	10
Air washer. (See Dehumidifier.)	
Compressors—	
Refrigerating	20
Air for pneumatic controls	20
Condensers—	
Shell and tube	20
Double pipe	20
Evaporation	15
Coolers, water—tank and coil or shell and tube	20
Dehumidifier	10
Drums, purge or surge	20
Ducts and other sheet metal work.*	
Fans	15
Filters, air, oil, self-cleaning	20
Dry cleanable	10
Gauges	15
Grilles and registers—	
Anemostats	20
Grilles and registers—	
Wall type	20
Ceiling	20
Window units	15
Placques	20
Sautrols.*	
Heaters—	
Boiler, oil burner and tank	20
Booster heaters	20
Electric heaters	15
Finned tube heaters, steam water cleanable tube	20
Preheaters and reheaters	20
Water heaters, open or closed type	20
Insulation—	
Cork, cold pipes and tanks	20
Magnesia, hot pipes	15
Wool felt	20
Asbestos	15
Louvres and screens, fresh air—	
Copper	25
Steel	15
Manometers	15
Motors—	
Synchronous and exciter set	20
Induction, indoor	20
Induction, weatherproof for outdoor	20
Piping, refrigerant and other	20
Pumps—	
Chilled water	20
Condenser water	20
Condensate	20
Dehumidifiers	22
Evaporative condenser	15
Sump	25
Well	25
Receivers, refrigerant	25
Regulators, suction or static pressure	5
Silicia gel beds	15
Spray pond	15
Switchboard, electric panel	20
Thermometers, room type or recording	15
Tower, cooling	15
Valves—	
Relief	20
Automatic expansion and by-pass	5
Solenoid	15
Water regulating	20
Ammeters	15
Clocks	15
Clocks, watchman	15
Compressors, air and vacuum	20
Electric clock systems:	
Clocks, time	20
Conduits, fittings and wiring. (See lighting systems)	
Motors and generators	20
Switch equipment—	
Boxes.*	
Switch parts	20
Elevators:	
Freight	25
Passenger	20
Fire equipment:	
Fire alarm systems	25
Movable equipment	20
Sprinkler system.*	
Guards, machine	25
Heaters, electric	10
Heaters, gas	15
Heating systems:	
Boilers and furnaces	20
Burner equipment—	
Gas	16
Oil	10
Radiators	25
Lighting systems:	
Conduits and fittings.*	
Wiring	20
Fixtures	15
Miscellaneous facilities:	
Awnings	5
Doors, louvre, ventilating	15
Incinerators	14
Safes and vaults.*	
Screens, window	10
Shades	5
Venetian blinds	8
Plumbing:	
Faucets and flushing valves	15
Bath tubs, lavatories, toilet bowls, etc	25
Pipes—	
Brass or copper.*	
Iron, cold-water	25
Iron, hot-water or steam	20
Sewer, cast-iron or vitrified.*	
Plumbing: (*cont'd*)	
Valves—	
Brass body, water or steam.*	
Iron body, water or steam	20
Pumps:	
Suction, pressure and sump	13
Roofs:	
Asbestos	25
Asphalt and tar (prepared)	15
Galvanized iron—	
Light or cold dipped	15
Heavy or hot dipped	20
Tar and gravel (5-ply)	20
Tarred felt	10
Copper, slate, tile, tin.*	
Starters, electric	20
Switchboards, electric	25
Tanks and vats, water:	
Metal	25
Wood	15
Telephone equipment:	
Conduits and fitting.*	
Wiring and fixtures	20
Tools, small, miscellaneous	5
Transformers	25
Trucks, conveyance (within building)	10
Trucks, lift	15
Voltmeters	15
Welfare equipment:	
Athletic	10
Cafeteria	10
Hospital and first aid	10
Police and fire	10
Wells and well pumps	25

---

*Life of building.

CONSTRUCTION EQUIPMENT

	Years
Automobiles:	
Light	2
Medium	3
Heavy	5
Backfillers, power:	
Light	3
Medium	5
Heavy	6
Tractor	5
Barges:	
Steel	30
Wood	25
Batcher plants:	
All steel, demountable	10
Steel frame, wood bin	10
Stationery	14
Wood frame and wood bin	7
Batch, measuring devices	4
Benders, bar	5
Bending blocks	10
Bending machines:	
Angle	15
Pipe	10
Rail	10
Bins:	
Steel, concrete	6
Steel	12
Wood	8
Bin frames, steel	6
Blacksmith shop outfits, portable	4
Blocks, pulley, differential	6
Blowers, mechanical	10
Boats:	
House	20
Motor	8
Boilers:	
Upright	7
Locomotive	15
Stationary	20
Borers (wood), portable	3
Boring apparatus, test	10
Boxes, mortar and batch	3
Brakes:	
Bending	10
Cornice (sheet metal)	22
Breakers, pavement, pneumatic	3
Buckets:	
Cableway	6
Clamshell	6
Concrete	5
Elevator	5
Orange peel	6
Bail, pivot turnover	5
Scraper or drag line	6
Buggies:	
Concrete	3
Timber	3
Building, job office or storage. (Life of job)	
Bulldosers:	
Gradebuilders	8
Tractor	4
Bunkers, stone portable, with screens	6
Burner equipment, gas and oil	12
Cables, wire	4
Cableways, cable only	3
Cableway carriage	5
Camping equipment	
Capstans, electric	
Cars:	
Ballast spreader	
Batch box, steel	
Boarding and tool	
Concrete	
Derrick, bridge	
Dump, steel	
Dump, wood	
Flat, steel	
Flat, wood	
Hand	
Hopper	
Scale	
Skip hoist	
Tank	
Carts, concrete	
Carts, tool (steel)	
Cement gun machines	
Chains:	
Hawsers and lines	
Power, transmission	
Channelers, rock	
Chipping and calking tools, pneumatic	
Chutes, concrete, gravity	
Clamps, column form	
Cleaning machine for exterior of building, steam or sand	
Compressors:	
Belt driven	
Electric, portable	
Gasoline, portable	
Motor-truck unit	
Steam portable	
Concrete machines, pneumatic	
Concrete mixers:	
Electric	
Gasoline, 3½s, 5s, 7s	
Gasoline, 10s, 14s	
Gasoline, 21s, 28s	
Paving, gas	
Paving, steam	
Steam	
Truck mounted	
Controllers, motor	
Conveyors:	
Belt, elevating—	
Portable	
Stationary	
Bucket	
Cable—	
Drag	
Monorail	
Chain, portable	
Portable	
Scraper	
Cranes:	
Bridge and cantilever	
Crawler—	
Electric—	
2½, 5 tons	
10, 15 tons	
20 tons and over	
Gas—	
2½, 5 tons	
10, 15 tons	
20 tons and over	
Locomotive gas	
Steam—	
2½, 5 tons	
10, 15 tons	
20 tons and over	
Locomotive	
Dock or wharf, traveling	
Dragline	
Universal (gas, 2½ to 5 ton), mounted on 10-ton truck	
Craneways:	
Steel	
Wood	
Crushers, rock:	
Portable	
Stationary	
Cutters:	
Bar, power	
Corrugated iron, hand	
Cutting and welding outfits, portable	
Davits	
Derricks:	
Boat	
Circle swing, hand	
Crab—	
Hand	
Power	
Guy—	
Steel	
Wood	
Stiffleg—	
Steel	
Wood	
Diggers, clay, pneumatic	
Drag lines:	
Electric—	
½, ¾ cubic yard	
1, 1¼, and 1½ cubic yards	
2 cubic yards and over	

3,200 HOURS!

rom One VELVETOUCH Master Clutch Facing

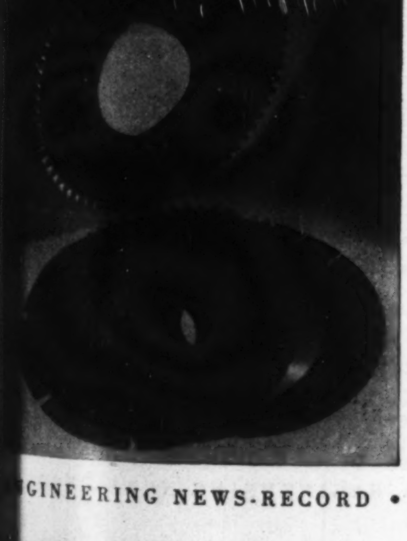
xcavating Contractor Reports mplete Satisfaction With lvetouch in D-4 Caterpillar

wo and one-half years of dependable, ooth performance . . . and still good for ny additional trouble-free operating hours! at's the story of the Velvetouch facing alled in the master clutch of a D-4 Caterlar tractor, owned and operated by Gerl os. Excavating Company of Euclid, Ohio.

ndrew Gerl, Jr., head of the firm, sums up opinion of Velvetouch in one sentence: e are now using Velvetouch facings exclusly in all of our earth-moving equipment."

ELVETOUCH IS ALL METAL... made entirely m compressed powdered metals, welded steel backing plates. And because lvetouch is all metal, it wears longer requires less adjustment . . . is little ected by oil or water.

ow: These Velvetouch Bimetallic clutch facings the type used in the master clutch of the D-4 Caterpillar tractor.



Equipped with a Trackson Traxcavator, this D-4 Caterpillar, owned and operated by Gerl Bros. Excavating Company, really digs into this pile of frozen earth . . . a punishing test for its Velvetouch clutch facing.

For complete details write to:

THE S. K. WELLMAN CO.
1374 EAST 51st ST. • CLEVELAND 3, OHIO

FOR BRAKE AND CLUTCH

USE Velvetouch

BIMETALLIC FRICTION MATERIAL—TRADE MARK REGISTERED

Drag Lines: (cont'd)	Years
Gasoline—	
½, ¾ cubic yard	5
1, 1¼ and 1½ cubic yard	9
2 cubic yards and over	12
Steam—	
½, ¾ cubic yard	6
1, 1¼ and 1½ cubic yards	10
2 cubic yards and over	12
Dredges:	
Clamshell	16
Dipper	8
Hydraulic	20
Pipe	10
Drill boats	12
Drill points, well	5
Drills:	
Airdrifter	3
Electric or pneumatic, hand, for wood or metal	5
Hand, electric	3
Rock, electric	3
Jackhammer	3
Steam	5
Traction, well	7
Tripod	7
Tunnel carriage	5
Well	10
Drums for oil (steel)	10
Elevators:	
Bucket, stationary	6
Cage (steel tower)	5
Engines:	
Blowing	12
Fire	7
Gas	10
Marine	20
Oil	20
Plumbing	14
Steam	11
Excavators:	
Cableway, complete	4
Trench, gasoline—	
7-foot depth	6
12-foot depth	6
18-foot depth	8
Trench, steam—	
7-foot depth	8
12-foot depth	8
18-foot depth	10
Trench, vertical boom	5
Wheel or ladder type	5
Extinguishers, fire	3
Fans, exhaust	15
Finishing machines	4
Floats, bridge (steel)	5
Forges, gas or oil burning	10
Forms:	
Concrete (metal pans)	5
Concrete, supports, adjustable	4
Steel, for—	
Pavements	4
Pipes	3
Roads	4
Tunnels and conduits	4
Walls	5
Furnaces, metal melting:	
Coal fired	10
Electric	12
Gas or oil	7
Generator sets:	
Steam engine	12
Turbine, headlight or floodlight	4
Gin poles (steel)	10
Gradebuilders (bulldozers)	8
Graders:	
Blade, road—	
7, 8 foot blade	4
9, 10 foot blade	5
over 10-foot blade	8
Elevating	8
Form, subgrade planers	6
Rooters, wheel	5
Grinders:	
Metal surface	15
Saw filers and setters	14
Surface, concrete	4
Hammers:	
Electric	3
Pneumatic riveting	3
Harness	4
Heaters, asphalt, tar, and pitch kettles	4
Helmets, gas and diving suits and equipment	10
Hoists:	
Air, electric, or steam	8
Chain	6
Electric monorail or post	5
Gas	6
Hand power	8
Slew—	
Electric	8
Steam	12
Holders on pneumatic	4
Horses	5
Hose:	
Fire, linen or rubber lined cotton	5
Metal, flexible	10
Oil	5
Reel or cart	10
Rubber, air, steam or water	10
Inundators, batch	4
Inland craft:	
Graders, hydraulic	7
Quarter boats	10
Jacks:	
Hydraulic	8
Rail	25
Rachet	8

Jacks: (cont'd)	Years
Screw	5
Steamboat, push and pull	3
Jibs, steam	17
Jointers, bench, electric, steam or gas	5
Ladders:	
Rope, wood rungs	2
Steel	3
Ladles, metal	7
Lathes:	
Metalworking	15
Woodworking	17
Launches, gasoline	10
Levee construction equipment:	
Drag lines	8
Shovels	8
Tower excavators	12
Life-saving equipment	10
Light plant	4
Lighters	22
Loaders, bucket:	
Crawler	5
Portable	5
Stationary	6
Locomotive battery	4
Locomotives, industrial:	
Diesel	10
Electric	16
Gas—	
Up to 10 tons	8
10 to 20 tons	15
Over 20 tons	20
Steam—	
Up to 10 tons	8
10 to 20 tons	18
Over 20 tons	20
Locomotives, standard gage	30
Magnets, lifting	15
Milling machines	15
Mixers; portable mortar	3
Less than ½ cubic yard	6
Over ½ cubic yard	8
Caterpillar	8
Motors:	
AC and DC—	
Large	12
Medium	10
Small	8
Hydraulic	5
Pneumatic	5
Mowers, right of way	5
Mules	5
Pile drivers:	
Barge	8
Railroad outfits	10
Steam, on skids	10
Track	12
Pile hammers, steam or air:	
Heavy	10
Light	4
Medium	5
Pipe:	
Black or galvanized	4
Wood	5
Wood and steel combination	6
Pipe lines and fittings, for floating dredges	10
Pit and quarry plants	6
Planers:	
Metalworking	15
Woodworking	20
Plows:	
Furrow	3
Rooter	6
Pontoons	20
Presses, drill	12
Pumping units:	
Electric—	
Centrifugal	6
Diaphragm	6
Piston	6
Gas—	
Centrifugal	6
Diaphragm	6
Highway contractor's pump	4
Piston	5
Steam, centrifugal	10
Pumps:	
Air lift	10
Centrifugal	6
Humdinger	6
Impulse	6
Hydraulic	15
Oil	10
Steam piston unit	6
Testing for pipe lines	15
Punches, hydraulic	20
Punches for steel, power	15
Racks, storage, for pipe and steel:	
Steel	20
Wood	15
Rails, steel	10
Razing equipment, for buildings	8
Reamers:	
Electric	3
Pneumatic	3
Riveters, pneumatic	5
Rollers:	
Concrete finishing (steel)	10
Road, gas	10
Road, steam	10
Rolls, ridge	5
Rowboats	6
Sand-blast outfits	10
Sawmills, portable	10
Saws:	
Band, cut-off and rip, power	10
Hand, Electric and pneumatic	3

	Years
Saws and woodworkers.	
Steel frames	10
Wood frames	5
Scales, large, track and wagon	20
Scarifiers:	
Attachments	4
Blocks, steerable	5
Drag, all steel	4
Grader type	4
Scows	25
Scows, dump	25
Scrapers:	
Blade, carryall	6
Fresno or Morman	2
Rotary	4
Slip	2
Wheel	5
Screens and bunkers, for gravel pits only	5
Screens, revolving	6
Sharpeners, drill	8
Shears, for steel, hand	10
Shores, adjustable	4
Shovel attachments, for cranes	6
Shovels:	
Electric or gasoline, crawler or wheel—	
½, ¾ cubic yard	5
1, 1¼, 1½ cubic yards	6
2 cubic yards and over	8
Steam, crawler or wheel—	
½, ¾ cubic yard	7
1, 1¼, 1½ cubic yard	8
2 cubic yards and over	10
Railroad, steam	10
Tunnel	4
Spouting plants, complete, concrete	4
Spraying equipment, paint	12
Spreaders, stone:	
Hopper wagon	5
Steel box	5
Steamers, paddle wheel	30
Switches:	
Portable	4
Stationary	5
Tampers, backfill, pneumatic	3
Tamping machines	10
Tanks:	
Gasoline, storage	6
Relay	6
Water or air, storage (steel)	10
Water storage (wood)	14
Tarpaulins and tents	3
Threading and cutting machines, pipe	10
Ties:	
Steel	12
Wood	6
Tongs, chain	4
Towers:	
Cableway—	
Steel	6
Wood	3
Steel boom with counterweights	5
Tracks, industrial, portable	6
Tractors:	
Electric—	
3-ton	3
5-ton	5
10-ton	6
20-ton	8
Gas or steam—	
3-ton	4
5-ton	6
10-ton	8
20-ton	10
Trailers:	
Dump—	
Steel	10
Wood	10
Platform, wood	4
Drop platform, heavy duty	5
Transformers, car	10
Trenching machines. (See Excavators.)	
Trucks, auto:	
General purpose or dump—	
½-¾ cubic yard	3
1-1½ cubic yards	5
2 cubic yards and over	8
Tugs, screw-propelled, steam or gas	25
Turntables, industrial railway	4
Vises	5
Wagons:	
Dump—	
Steel	6
Wood	6
Farm—	
Heavy	10
Light	10
Road oilers, tank, steel	10
Tank or sprinkler—	
Steel	10
Wood	8
Washers, gravel	3
Welding outfits, acetylene or electric	10
Wheelbarrows	2
Winches, electric and pneumatic	10
Wire and cables:	
Electric	6
Flexible, steel armored	8

BRIDGES

Concrete and steel or masonry, large	100
Concrete and steel or masonry, small	75
Steel, heavy	50
Steel, light	40

WATER SUPPLY

	Years
Impounding dams	[illegible]
Springs and wells	[illegible]
Infiltration galleries and tunnels	[illegible]
Collecting conduits and reservoirs	[illegible]
Mains, cast iron:	
4-inch and less	[illegible]
6-inch	[illegible]
8- to 10-inch	[illegible]
12-inch and over	[illegible]
Settling basins	[illegible]
Coagulating basins	[illegible]
Filters	[illegible]
Steam engines	[illegible]
Internal combustion engines (Diesel type)	[illegible]
Pumps	[illegible]
Stand pipes	[illegible]
Meters	[illegible]
Hydrants	[illegible]
General office equipment	[illegible]
General shop equipment	[illegible]
General store equipment	[illegible]
Laboratory equipment	[illegible]

ELECTRIC UTILITIES

Steam Production

	Years
Structures and improvements	[illegible]
Boiler plant equipment	[illegible]
Engines and engine driven generators	[illegible]
Turbo-generator units	[illegible]
Accessory electric equipment	[illegible]
Miscellaneous power plant equipment	[illegible]

Hydraulic Production

Structures and improvements	75
Reservoirs, dams and waterways	150
Waterwheels, turbines and generators	35
Accessory electric equipment	35
Miscellaneous power plant equipment	35
Roads, railroads and bridges	100

Transmission Plant

Structures and improvements	45
Station equipment	28
Towers and fixtures	50
Poles and fixtures	33
Overhead conductors and devices	50
Underground conduit	75
Underground conductors and devices	40
Roads and trails	60

Distribution Plant

Structures and improvements	45
Station equipment	28
Storage battery equipment	20
Poles, towers and fixtures	35
Overhead conductors and devices	33
Underground conduit	60
Underground conductors and devices	40
Line transformers	28
Services	25
Meters	28
Installations on customers' premises	25
Street lighting and signal systems	22

ARTIFICIAL GAS

Production Plant

	Years
Structures and improvements	50
Boiler plant equipment	30
Other power equipment	40
Benches and retorts	35
Coke ovens	35
Producer gas equipment	33
Water gas generating equipment	33
Petroleum gas equipment	33
Other gas generating equipment	33
Coal, coke, and ash handling equipment	40
Gas reforming equipment	33
Purification equipment	33
Residual refining equipment	40
Other production equipment	33

Distribution Plant

Structures and improvements	[illegible]
Mains	[illegible]
Cast iron pipe—	
4 inches and less	[illegible]
6 inches	[illegible]
8 to 10 inches	[illegible]
12 inches and over	[illegible]
Steel pipe—	
4 inches and less	[illegible]
5 to 7 inches	[illegible]
8 inches and over	[illegible]
Wrought iron pipe—	
¾ inches to 1½ inches	[illegible]
2 to 2½ inches	[illegible]
3 to 6 inches	[illegible]
8 to 10 inches	[illegible]
12 inch and over	[illegible]
Pumping and regulating equipment	[illegible]
Services	[illegible]
Meters	[illegible]
Meter installations	[illegible]
House regulators	[illegible]
House regulator installations	[illegible]
Other property on customers' premises	[illegible]
Other distribution system equipment	[illegible]

alion

LLERS and GRADERS

ands of Galion machines are
ged in vital war construction
ing new roads, airfields, docks,
bases. The contractors and en-
rs operating Galion rollers and
ders are obtaining valuable train-
This training will not be wasted
there will be more progressive
truction in the post-war period.

dy proved in this war construc-
Galion units will again serve
the war in reconstruction here
abroad. It will pay you to re-
ber Galion in your post-war
ing.

With a war in progress and the resultant rationing of gasoline we are not so much concerned with the inadequacy of our highway facilities . . . but after the war is another thing. The Federal, State and County governments are looking forward to the needs of tomorrow's traffic . . . are doing something about it NOW.

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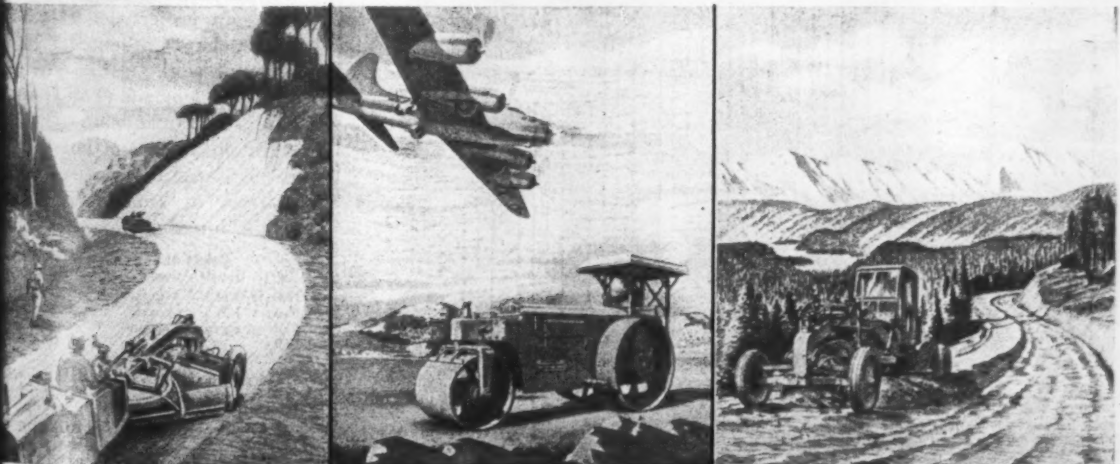


Estimating Jobs From Construction Dollar

Summary of data on man-hours of labor from construction

ENGINEERING COST estimating was once a relatively simple matter limited to the dollars and cents involved, but postwar plans are incomplete without a parallel estimate of the man-hours of labor and the type of jobs to be provided by the proposed investment in new construction.

The estimating of over-all man-hours of labor required for construction is a new art, born of the unemployment of the thirties. The Bureau of Labor Statistics, using data from projects financed with Public Works Administration grant and loan fun pioneered with extensive studies, n only of the man-hours of labor pr vided by construction, but also of t average cost per man-hour and t ratio of work on the site to off-s employment.

These costs and these ratios va with different classes of constructi and under differing economic con tions. It is the purpose of this artic to bring together in one place su data as are now available on the rel tion of construction dollars to jo for construction-workers at the si as well as for off-site workmen factory, mine and forest.

Roughly, before the war, one co struction dollar produced one ma hour of work. On a general averag one-third of this was on the constru tion site and two-thirds was used produce the materials and install equipment which the site worke erected in place.

The accompanying Table I an chart show the results, for the pri cipal classes of construction, of B reau of Labor Statistics studies $1,000,000 worth of PWA constru tion contracts during 1933-38. street and road construction dol provided 1.144 man-hours of wor in the ratio of 1.41 off-site to on-site at an average of $0.87 p man-hour.

At the other extreme a steam pow and light project dollar (not show in the chart) produced 0.781 ma hours of work, in the ratio of 3. off-site to 1 on-site at an average co of $1.28 per man-hour.

An illustration of how the on-s to off-site ratio varies is afforded b analysis of construction work b origin, for example:

Origin of Construction	Man-hour Ra Off-site to	On-
Non-federal PWA program	2	1
Federal PWA program	1	1
Federal regular program	1	1
WPA	0.16	1

During the war, with its artific restrictions on materials, the avera off-site ratio of labor resulting fr construction was lower than the n

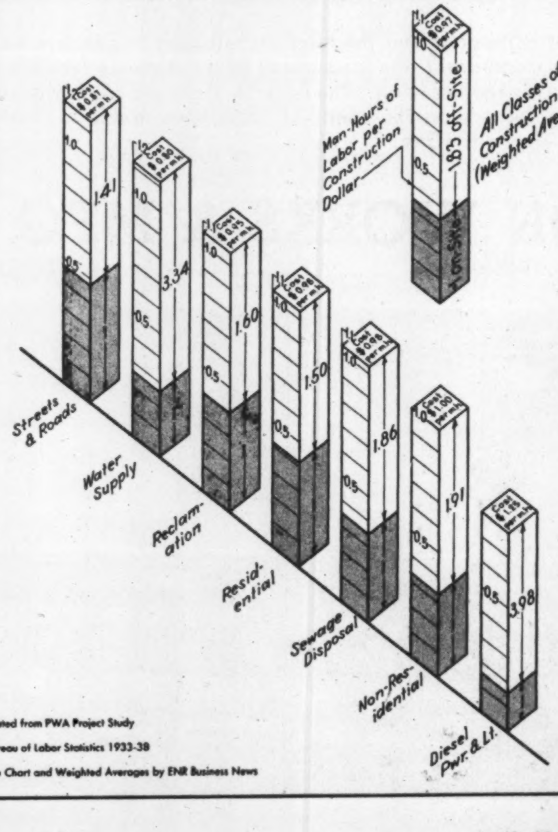
TABLE I—ON-SITE AND OFF-SITE MAN-HOURS PER $1,000,000 OF PWA CONSTRUCTION CONTRACTS AWARDED (BY TYPES OF PROJECTS)

(In Thousands of Man-Hours)

Type of Project	On-Site	Off-Site	Total man-hours	Ratio; off-site to on-site	Cost per man-hour
Non-residential building	344	657	1,001	1.91	$1.00
Residential building	410	615	1,025	1.50	.98
Water supply	262	876	1,138	3.34	.88
Sewage disposal	358	667	1,025	1.86	.98
Streets and roads	475	669	1,144	1.41	.87
Reclamation	402	645	1,047	1.60	.95
Steam power and light	161	620	781	3.85	1.28
Diesel power and light	161	641	802	3.98	1.25
Naval vessels	491	589	1,080	1.20	.93

Source: Bureau of Labor Statistics.
The Economic Effects of the Federal Public Works Expenditures, '33–'38.
November, 1940, National Resources Planning Board.

ON-SITE AND OFF-SITE MAN-HOURS OF CONSTRUCTION LABOR COMPARED WITH CONSTRUCTION EXPENDITURES



Estimated from PWA Project Study
By Bureau of Labor Statistics 1933-38
Air-Vu Chart and Weighted Averages by ENR Business News

TABLE II—WAR CONSTRUCTION PROJECTS
SITE AND OFF-SITE MAN-HOURS PER MILLION DOLLAR EXPENDITURE (BY TYPE OF PROJECT)

Type of Projects	Man-hours Total	Man-hours Site	Man-hours Off-site	Ratio Off-site to Site
Construction contracts awarded for:				
Defense housing:				
With circulating heaters	803,200	353,000	450,200	1.28
With forced warm air heating systems	755,600	324,000	431,600	1.33
Plants for Aircraft production	680,800	261,800	419,000	1.60
Tent camps	883,300	443,800	439,500	0.99
Hangars	696,400	222,200	474,200	2.13
Productive facilities construction	695,400	284,500	410,900	1.44
General hospitals	732,000	315,000	417,000	1.32
Ordnance plants	734,800	395,700	339,100	0.86
Sewers and sewerage systems	758,800	314,000	444,800	1.42
Water supply	760,100	346,300	413,800	1.19
Average for all project groups	750,040	326,030	424,010	1.30

Source: U. S. Department of Labor, B.L.S. Releases dated April 21, 1942 and January 26, 1943.

TABLE III—WAR CONSTRUCTION PROJECTS—1943

(Computed from Bureau of Labor Statistics report, see Table on following page, on Labor, Materials and Man-Hours Per $1,000,000 of Cost for Specified Types of Federal Construction completed January, 1943, to January, 1944)

Type of Project	Ratio Off-site to Site Labor	Average Hourly Earnings At Site	Average Hourly Earnings Off-site	Average Hourly Earnings Site and Off-site
Building Construction:				
Hospitals	1.185	$1.08	$1.195	$1.14
Military buildings[1]	1.27	1.095	1.17	1.14
Ordnance plants	.85	1.14	1.12	1.13
Schools	1.26	1.055	1.225	1.15
War housing	1.335	1.11	1.115	1.11
Non-Building Construction:				
Sewers and sewer system	1.345	.99	1.16	1.08
Streets and roads	1.33	.99	1.07	1.045
Water supply systems	1.18	.99	1.19	1.12

[1] Includes barracks, mess halls, recreational buildings at military posts and station.

ral PWA program ratio before war. This off-site to on-site ratio aged 1.3 to 1 for 10 classes of truction and ranged from 0.99 tent camps to 2.13 to 1 for gars, Table II.

nalysis of the 1943 labor, mate- and man-hour report by the Bu- of Labor Statistics just released, ws, Table III, a further slight re- tion from 1942 in the off-site r ratio. It also shows an increase he average hourly earnings over e reported in Table I for 1933-38. on-residential building total labor per man-hour for example in- sed from $1.00 in 1933-38 to 13 for ordnance plants, $1.14 for pitals and military housing, $1.15 schools. Housing labor costs in- sed from $0.98 per man-hour in 3-38 to $1.11 in 1943; sewers from prewar $0.98 to $1.08, streets and ds from $0.87 to $1.045, water ply systems from $0.88 average 1933-38 to $1.12 per man-hour in 43.

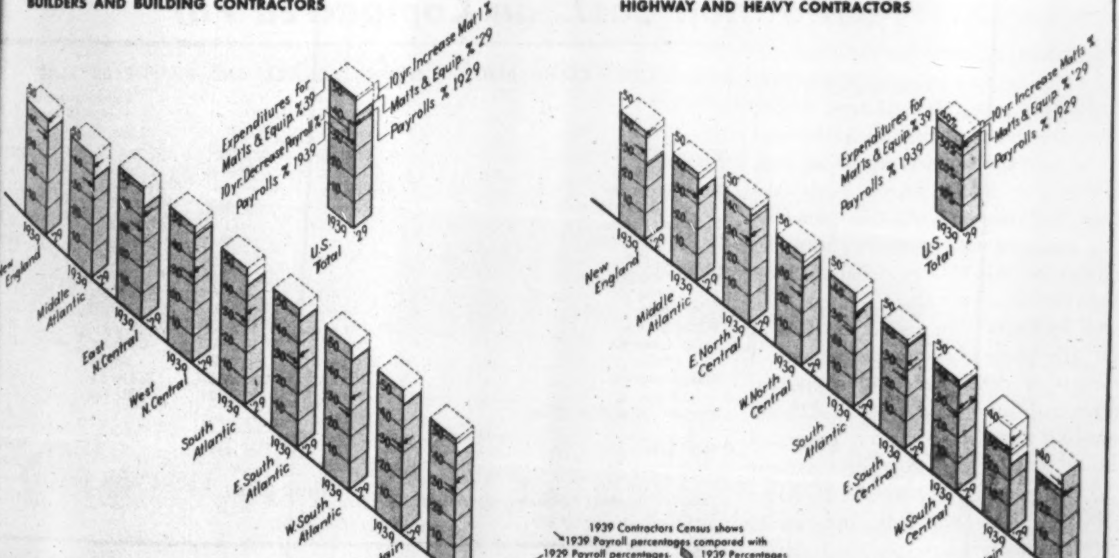
Trend toward more off-site labor

Contractor expenditures increased 3½ percent for material and in- lled equipment and decreased by percent for payrolls at the site in decade between the 1929 and the 1939 contractor census by the U. S. Bureau of Census. The average contractor in 1939 spent 46.7 percent of his construction dollars for materials and installed equipment, 42.9 percent in 1929. For payrolls he spent 32.9 percent in 1939, 36.9 percent in 1929. These percentages are based on dollar volume of "work performed."

In this same period, 1929-39, construction labor wage rate averages increased 6 percent for skilled work-

COMPARISON OF CONTRACTOR EXPENDITURES 1939 WITH 1929

Shows Trend Away from On-site Construction Labor to Greater Use of Off-site Labor



1939 Contractors Census shows 1939 Payroll percentages compared with 1929 Payroll percentages. 1939 Percentages of Expenditures for Materials and Installed Equipment compared with 1929

Data from U.S. Construction Census-1939

Air-Vu Chart by Engineering News-Record, Business News Dept.

ers and 25 percent for common labor while materials prices increased 1 percent. This means that the man-hours of work at the site decreased even more than the dollar value of payrolls.

Building contractors naturally show a greater percentage of expenditure for materials and equipment than do highway and heavy contractors, but in both cases the materials expenditures exceed payrolls. The only exceptions throughout the country are the heavy and highway contractors in the Mountain and Pacific states. In the former, the labor percentage in 1929, 34.6%, exceeded materials and equipment, 25.5%. In the Pacific states a complete reversal is found, the payroll percentage increased from 30.4 in 1929 to 34.5 in 1939, and the materials and installed equipment percentage decreased from 39.1 percentage in 1929 to 31.9 in 1939.

After the war

In translating construction dollar volume estimates into potential postwar jobs many problems arise. Should the 1940 construction dollar be used? or a 194V (for victory) dollar? New York State's Postwar Planning Committee has specified that estimates for postwar projects be based on 1940 costs. With such a standard base it should be a simple matter to convert both cost and man-hour estimates to 194V costs—when they are known.

Construction costs as measured by the *Engineering News-Record* cost indexes were 17 percent higher in 1940 than for the 1933-38 avera the period covered by the Bureau Labor Statistics study of man-ho of labor resulting for expenditure construction dollars.

Contractors and engineers, in viewed by an *Engineering Ne Record* editor expect postwar co struction costs to be from 25 perce to 45 percent higher than costs p vailing before the war (see Postw Construction Costs article on pa 138.)

Like any "new art", the estimati of man-hours of work that will should result from construction, inexact and subject to change wi new conditions. The good health the construction industry will be proportion to the productivity of i dollar-man-hour ratio.

Cost Data on Federal Construction Projects

Bureau of Labor Statistics, Division of Construction and Public Employment

LABOR, MATERIALS AND MAN-HOURS PER $1,000,000 OF COST FOR SPECIFIED TYPES OF FEDERAL CONSTRUCTIO

(Projects completed January, 1943 to January, 1944)

Type of Project	Expenditures (Thousands of Dollars)			Percent for Labor and Material		Man-Hours Worked		
	Labor at Constr. Site	Material	Total Labor and Mat'l.	Labor %	Material %	At Constr. Site	Off-site Labor	Total Man-Hours
Building Construction:								
Hospitals	$353	$450	$804	35.4	45.1	322,700	382,500	705,200
Military buildings[1]	339	460	800	34.0	46.1	310,200	393,100	703,300
Ordnance plants	452	377	829	45.2	37.7	396,500	336,100	732,600
Schools	333	485	819	33.3	48.6	315,400	396,800	712,200
War housing	347	466	813	34.7	46.6	313,600	418,500	732,100
Non-Building Construction:								
Sewers and sewer systems	314	488	803	31.4	48.9	316,900	425,900	742,800
Streets and roads	319	468	788	32.0	46.9	323,700	430,700	754,400
Water supply systems	348	499	847	34.9	49.9	346,900	409,600	756,500

[1] Includes barracks, mess halls, recreational buildings at military posts and station.

Foundation Costs on Compacted Fill

To eliminate need for carrying column footings at varying depths to firm soil, for a one-story mill-type timber ordnance plant in the northwest, and to insure against settlement of concrete floor under heavy loads, the poor soil encountered was removed and replaced with carefully-controlled compacted fill to carry shallow footings and the floor slab. Savings realized by use of compacted fill method on this project as compared with a design of deep piers and supported floor slab amounted to $171,827 according to the table below, presented in an article "Building Foundations on Compacted Fill" by W. E. King, of Toltz, King and Day, Inc., architects and engineers, St. Paul, Minn. (*ENR*, Sept. 9, 1943; p. 403.)

Actual cost of compaction, including labor and equipment rental was 32c. per cu. yd., a cost which was justified, according to the author, by the saving in critical materials used, and by allowing the laying of water and sewer pipe under the floor on solid ground.

COST COMPARISON, COMPACTED FILL AND SUPPORTED SLAB

Item	Compacted Fill		Piers Supporting 460 Slab Bays	
	Quan.	Cost*	Quan.	Cost*
Excav., General	132,683 c.y.	$59,707	131,818 c.y.	$79,090
Hand	4,272 c.y.	7,092	1,700 c.y.	1,700
Backfill, Borrow	91,270 c.y.	49,830	91,270 c.y.	63,890
Material on site	108,730 c.y.	19,680	108,730 c.y.	43,492
Footings, Forms	....	......	33,800 s.f.	10,140
Concrete	1,424 c.y.	16,234	1,670 c.y.	19,038
Rein	10 ton	1,070	66 ton	7,082
Piers, Forms	13,450 s.f.	4,035	100,120 s.f.	40,048
Concrete	307 c.y.	3,500	1,665 c.y.	19,081
Rein	½ ton	54	81 ton	8,667
Walls, Forms	50,140 s.f.	17,048	59,800 s.f.	20,332
Concrete	899 c.y.	10,249	990 c.y.	11,286
Rein	2⅕ ton	268	33 ton	3,531
Slab, Concrete	7,180 c.y.	81,852	8,410 c.y.	95,874
Rein	160 ton	17,120	297 ton	31,770
Support under floor piping	....	......		4,380
Total Cost		$287,742		$459,569
				287,742
Total saving using compacted fill method				$171,827

**Labor and material costs only, no overhead or profit included.*

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Index of Small House Costs

THE INDEX of Building Costs for the same standard six-room house in approximately 80 United States cities is computed monthly by the Federal Home Loan Bank Board. The cities, individual indexes for which are tabulated on the following page, are divided into three groups, and one group is reported each month. Thus, the index of costs in each city is available four times a year.

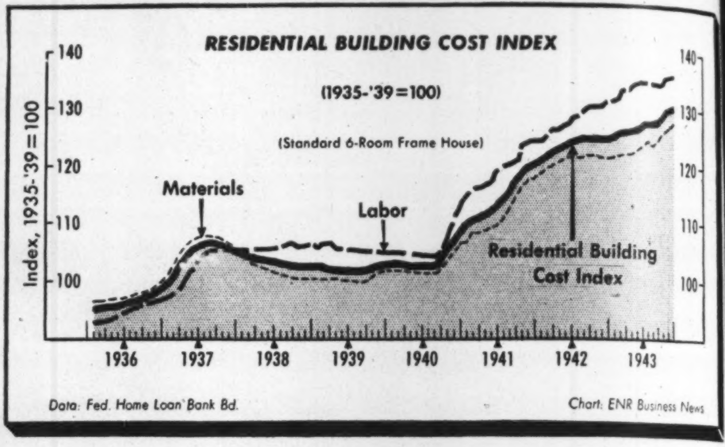
The combined index of small house costs for the United States is based on these 80-city reports, and is computed in the following manner: to the average cost for each month for the reporting cities in that month, is added the cost for the previous month from the prior reporting cities and the cost in the subsequent month for the third reporting group. The arithmetic average of the three reporting groups is taken as the average cost for the middle month for the entire nation. This 3-month moving average is computed and reported monthly.

The house on which costs are reported is a detached six-room home of 24,000-cu.ft. volume. Living room, dining room, kitchen and lavatory are on first floor, and three bedrooms and bath on the second. Exterior is wide-board siding with brick and stucco as features of design. Best quality materials and workmanship are used throughout. It includes all fundamental structural elements, an attached one-car garage, unfinished cellar, unfinished attic, fireplace, essential heating, plumbing and electric wiring equipment, and complete insulation. The building involves the use of about 110 material items, and nine major labor groups. Five percent is added to the labor cost to cover compensation insurance; 2 percent is added to total cost for operating expenses; and 10 percent is added for builders' profit.

Reported costs do not include the cost of land nor the surveying of the land, the cost of planting the lot, nor of providing walks and driveways. They do not include architect's fee, cost of building permit, financing charges, nor sales costs.

Prices on same building materials list are obtained quarterly from same dealers, and wages are from the same reputable contractors and builders.

Indexes of Building Costs for Standard 6-Room Frame House (1935-1939 = 100) Fed. Home Loan Bank Bd.



Data: Fed. Home Loan Bank Bd.

Chart: ENR Business News

Combined Index

	1936	1937	1938	1939	1940	1941	1942	1943
January	94.7	99.6	104.3	101.9	102.3	109.3	120.6	124.7
February	94.9	100.9	103.8	102.0	102.4	110.2	121.2	125.5
March	95.0	102.6	103.5	102.1	102.3	110.4	122.0	125.7
April	95.3	104.2	103.1	101.8	102.1	111.2	122.3	125.7
May	95.6	105.0	102.8	101.6	102.2	111.6	122.8	126.2
June	95.8	105.8	102.8	101.4	102.1	112.4	123.5	126.8
July	96.2	106.3	102.7	101.3	102.0	113.6	123.7	127.3
August	96.6	106.4	102.3	101.2	102.1	115.1	124.0	127.1
September	96.8	106.3	102.3	101.6	102.9	116.5	124.4	127.6
October	97.1	106.0	102.1	102.0	104.6	118.5	124.5	129.1
November	97.7	105.7	102.1	102.4	106.4	119.2	124.4	129.8
December	98.5	104.9	102.0	102.5	108.1	119.9	124.5	130.5
Average	**96.2**	**104.5**	**102.8**	**101.8**	**103.3**	**114.0**	**123.2**	127.2

Material Index

	1936	1937	1938	1939	1940	1941	1942	1943
January	95.8	101.0	104.1	100.0	101.4	106.6	118.6	121.5
February	96.0	102.5	103.3	100.0	101.5	107.8	119.3	121.9
March	96.2	104.5	102.6	100.0	101.4	108.0	120.0	122.0
April	96.3	105.9	102.1	99.9	101.3	108.7	120.5	121.8
May	96.5	106.8	101.7	99.7	101.3	108.8	121.0	122.2
June	96.6	107.0	101.5	99.5	101.3	109.2	121.3	123.0
July	97.0	107.2	101.1	99.4	101.2	110.7	121.2	123.7
August	97.4	107.3	100.4	99.3	101.4	112.6	121.2	123.4
September	97.5	107.1	100.4	99.9	101.9	114.4	121.5	124.4
October	97.8	106.5	100.2	100.6	103.4	116.0	121.6	126.0
November	98.4	106.0	100.2	101.3	104.6	116.9	121.5	126.8
December	99.5	104.9	100.0	101.5	105.9	117.7	121.4	127.6
Average	**97.1**	**105.6**	**101.5**	**100.1**	**102.2**	**111.5**	**120.8**	123.7

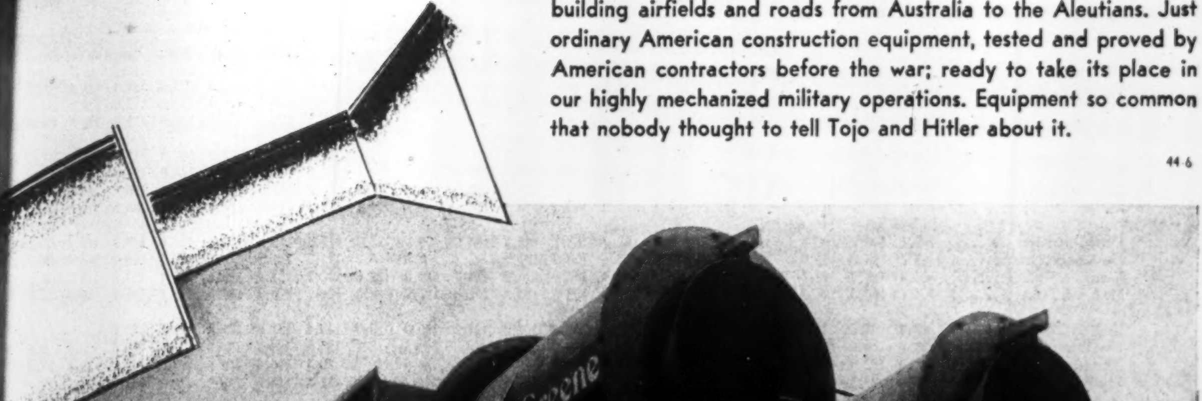
Labor Index

	1936	1937	1938	1939	1940	1941	1942	1943
January	92.6	96.9	104.7	105.6	104.0	114.5	124.5	130.9
February	92.6	97.6	104.7	105.9	104.2	115.1	125.0	132.5
March	92.7	98.9	105.2	106.1	104.1	115.3	126.0	133.0
April	93.2	100.7	105.2	105.6	103.8	116.1	125.9	133.4
May	93.8	101.7	105.1	105.3	103.7	117.0	126.4	134.3
June	94.3	103.3	105.3	105.0	103.5	118.6	127.8	134.3
July	94.7	104.4	105.7	105.1	103.4	119.3	128.5	134.3
August	94.9	104.7	106.0	104.9	103.6	120.0	129.4	134.2
September	95.3	104.8	106.1	104.9	104.8	120.7	130.2	133.8
October	95.8	105.0	105.8	104.8	106.9	123.3	130.2	135.0
November	96.3	105.0	105.8	104.6	109.8	123.9	130.2	135.6
December	96.4	104.8	105.8	104.4	112.5	124.2	130.7	136.0
Average	**94.4**	**102.3**	**105.4**	**105.2**	**105.4**	**119.0**	**127.9**	133.9

Secret Weapon

Hitler and Tojo don't know it, but they have caught more hell through American construction equipment and methods than any secret weapon their evil minds can dream up. This is a Barber-Greene Dual Drum Dryer, not a rocket gun—one of the units of the B-G Army Airport Asphalt Plant. These plants built the runways that made possible the successful invasion of Sicily and Italy. They are resurfacing R.A.F. and American runways in England, building airfields and roads from Australia to the Aleutians. Just ordinary American construction equipment, tested and proved by American contractors before the war; ready to take its place in our highly mechanized military operations. Equipment so common that nobody thought to tell Tojo and Hitler about it.

44-6



"3,000,000 miles obsolete", says Saturday Evening Post, of our highways and streets. What are you doing to help their rejuvenation? Engineering is needed; modern construction methods and equipment should be suggested to save tax money and improve the job. Let's have better roads for a better world!

GREENE

AURORA, ILLINOIS, U. S. A.

Index of Costs for Standard House in Representative Cities — 1935-1939 = 100

Federal Home Loan Bank Board

	1939				1940				1941				1942				1943		
	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.	Jan.	Apr.	July	Oct.	Jan.	Apr.	July
Albany, N. Y.	99.5	101.6	100.4	101.9	102.2	103.3	102.5	102.9	112.3	119.4	120.6	122.5	124.6	123.2	130.9	134.2	144.8	147.5	154.7
Atlantic City, N. J.	97.4	96.7	98.7	105.5	105.4	102.4	100.7	103.9	118.7	120.6	120.6	122.1	122.7	124.9	125.3	125.4	125.4	125.6	150.0
Boise, Idaho	103.2	104.6	104.6	103.8	105.6	106.2	106.5	108.4	111.7	112.3	117.4	117.4	120.4	125.5	125.5	125.5	125.5	125.9	126.3
Buffalo, N. Y.	102.0	100.2	99.2	104.7	100.6	100.9	101.1	101.6	108.8	112.0	117.3	121.6	123.7	125.4	128.2	128.1	128.2	130.8	130.2
Camden, N. J.	101.9	103.7	101.8	106.5	108.5	108.8	108.8	114.2	117.1	117.3	124.2	141.5	141.0	142.1	145.9	147.0	145.6	145.6	145.6
Casper, Wyo.	101.9	103.1	102.9	104.0	101.5	98.8	95.0	95.0	101.7	100.5	100.8	101.8	103.6	103.6	103.4	.....	.....	.....	.....
Des Moines, Iowa	101.6	101.6	101.8	102.0	102.6	102.6	102.8	103.6	103.8	103.4	100.5	105.3	108.0	109.9	113.0	113.8	114.2	114.2	114.2
Detroit, Mich.	108.3	107.2	107.2	104.0	101.9	102.0	102.4	105.1	112.0	108.6	112.3	119.3	119.6	122.1	122.2	128.3	128.3	130.5	130.5
Duluth, Minn.	101.2	101.5	101.6	102.3	104.9	104.8	104.3	104.3	104.5	104.5	105.7	109.6	110.8	112.8	118.4	118.1	118.5	118.5	118.5
Evansville, Ind.	102.5	100.7	103.3	106.7	107.1	107.0	107.0	110.7	114.1	113.5	114.4	119.7	127.0	126.4	126.4	126.2	126.4	126.4	.....
Fargo, N. D.	99.1	99.0	98.1	102.3	102.6	102.4	100.7	101.5	103.6	103.0	101.8	107.9	108.3	111.4	113.6	115.4	118.6	118.6	118.5
Grand Rapids, Mich.	107.0	105.8	105.6	102.9	99.6	100.0	102.6	106.8	116.1	112.5	118.5	129.8	133.2	136.8	127.0	128.5	128.6	127.8	.....
Great Falls, Mont.	102.9	103.4	101.9	101.3	102.3	101.5	101.3	101.3	105.1	107.4	107.2	111.0	111.6	112.8	112.8	.....	.....	.....	114.0
Indianapolis, Ind.	102.9	105.3	105.1	101.0	98.5	96.8	96.9	99.1	115.0	116.5	117.4	121.5	122.6	126.1	126.4	128.2	125.0	125.5	125.5
Kansas City, Mo.	103.1	105.8	108.6	105.8	106.9	106.5	104.4	102.9	110.7	110.4	110.8	116.1	118.6	125.5	125.6	129.3	129.6	.....	.....
Newark, N. J.	103.5	103.4	102.6	105.6	106.6	106.6	106.7	107.0	113.2	114.7	131.1	135.8	136.5	137.0	146.3	153.9	155.5	156.1	167.0
Portland, Ore.	99.4	95.6	96.2	97.8	97.9	97.6	97.5	98.5	99.0	101.0	103.2	109.8	112.5	113.9	119.0	119.0	132.5	130.9	131.0
St. Louis, Mo.	98.7	98.2	96.5	98.2	100.1	99.3	99.2	103.3	109.0	109.5	111.7	120.1	120.5	124.3	125.4	119.9	119.8	119.8	117.9
St. Paul, Minn.	107.9	108.5	108.2	108.2	107.8	107.3	107.1	107.5	109.2	109.2	109.7	112.7	114.7	115.9	118.7	118.7	119.1	119.2	119.2
Salt Lake City, Utah	100.5	103.0	102.8	102.5	103.1	102.8	102.7	103.8	108.5	110.9	113.9	118.8	119.8	121.6	121.3	121.3	120.9	121.6	121.6
Seattle, Wash.	102.2	102.7	101.9	102.8	102.9	103.6	103.3	104.2	107.8	112.3	114.4	122.5	125.3	125.5	123.4	123.4	125.7	128.4	128.4
Sioux Falls, S. D.	105.1	104.0	100.8	101.4	102.2	103.3	103.3	103.7	102.0	104.0	104.4	110.8	112.3	110.4	116.4	118.3	118.6	117.4	117.4
South Bend, Ind.	96.2	97.6	98.5	103.7	102.9	104.6	104.5	107.8	115.3	114.8	117.8	120.6	128.4	130.9	131.2	132.3	132.5	132.5	.....
Spokane, Wash.	96.4	97.8	98.2	100.9	101.4	101.4	101.5	102.2	110.8	110.[illegible]	111.5	115.1	115.4	121.7	121.1	.....	121.5	.....	.....
White Plains, N. Y.	99.1	98.4	97.2	99.0	100.1	99.8	97.1	100.1	112.7	114.2	117.0	123.7	124.3	126.0	126.2	127.8	129.0	129.7	129.7

	1939				1940				1941				1942				1943		
	Feb.	May	Aug.	Nov.	Feb.	May.	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.	May	Aug.	Nov.	Feb.	May	Aug.
Albuquerque, N. M.	102.6	100.9	100.8	99.5	98.6	97.8	98.6	106.5	109.9	110.5	112.2	122.7	.....	.....	128.2	.....	.....	.....	.....
Charleston, W. Va.	102.3	102.0	101.4	101.9	101.9	102.1	101.3	104.0	107.0	109.8	108.8	113.8	115.0	117.2	123.5	123.5	123.3	123.5	123.5
Cincinnati, Ohio	96.3	96.6	96.3	97.4	96.7	96.5	97.4	100.5	100.3	99.4	103.4	111.0	111.1	113.1	111.9	112.0	112.0	112.3	112.3
Cleveland, Ohio	101.1	101.9	102.1	107.6	106.9	105.3	108.4	109.3	108.2	112.8	114.1	116.9	117.7	119.5	119.6	119.5	119.5	120.5	120.5
Columbus, Ohio	99.4	98.7	98.3	101.0	101.4	101.5	100.6	103.4	104.3	107.5	111.4	115.6	115.7	116.9	117.2	117.6	117.6	117.7	117.7
Dallas, Tex.	98.3	95.4	94.9	93.2	94.6	94.5	94.6	105.2	115.7	117.3	119.2	131.5	134.3	128.3	128.0	128.8	129.0	129.0	.....
Houston, Tex.	100.6	100.7	100.2	99.9	101.0	100.5	96.8	104.9	106.3	107.2	108.3	117.8	119.2	116.5	116.3	117.1	116.7	116.7	116.9
Jackson, Miss.	105.1	103.3	103.0	105.1	105.4	106.3	106.3	109.6	110.1	114.1	115.3	121.1	123.0	123.0	123.0	123.2	123.5	123.6	123.5
Little Rock, Ark.	100.1	100.9	100.6	99.8	99.8	99.6	98.9	103.1	104.3	105.3	106.3	117.0	117.8	118.4	121.5	121.5	120.3	119.8	120.0
Los Angeles, Calif.	98.2	96.0	95.0	96.3	95.4	95.3	95.4	100.9	101.7	102.7	105.5	109.2	111.9	114.2	119.2	120.6	120.4	119.4	120.0
Louisville, Ky.	100.8	101.0	100.7	104.0	104.1	104.8	104.4	107.0	116.9	116.7	119.0	122.0	122.9	123.4	123.4	123.4	123.9	123.7	123.8
Memphis, Tenn.	104.7	102.5	101.2	104.0	103.7	103.6	102.8	108.6	116.9	117.0	117.7	123.0	124.7	126.3	126.3	126.2	125.7	125.6	127.0
Nashville, Tenn.	99.0	97.3	96.6	97.9	97.0	96.4	95.1	103.2	107.9	111.2	114.0	118.3	120.4	121.5	121.4	121.4	121.4	.....	.....
New Orleans, La.	102.2	101.2	101.4	105.3	104.8	103.6	102.5	113.8	116.6	118.3	119.5	123.7	125.3	125.7	126.1	126.0	125.5	125.5	125.6
Philadelphia, Pa.	102.0	102.6	103.8	105.6	105.8	107.4	110.0	119.4	119.3	119.3	124.8	136.0	139.1	145.9	145.5	143.4	143.1	149.3	150.8
Phoenix, Ariz.	98.3	96.5	97.9	99.4	99.0	99.0	99.0	101.2	103.9	104.3	108.3	110.5	111.3	113.9	112.7	112.7	112.7	112.8	112.8
Pittsburgh, Pa.	106.9	106.1	106.6	105.9	103.5	101.5	101.8	106.5	112.1	113.7	120.8	120.7	120.7	132.2	128.3	129.2	133.0	138.4	136.7
Reno, Nev.	102.3	102.1	102.3	104.3	105.0	105.5	105.5	108.6	108.3	108.6	110.2	117.2	116.0	116.6	117.3	119.2	119.2	120.8	120.9
San Antonio, Tex.	101.5	101.4	101.2	98.1	96.4	94.8	94.5	100.7	113.4	113.6	115.5	131.4	132.6	127.6	127.4	128.5	128.5	128.5	.....
San Diego, Calif.	101.4	100.3	98.2	95.9	95.0	93.1	93.2	107.0	106.4	106.7	111.9	123.1	124.1	125.0	126.3	.....	.....	.....	.....
San Francisco, Calif.	103.8	103.1	102.5	102.3	102.4	102.1	101.5	103.1	103.3	105.4	112.3	114.3	118.9	121.6	121.6	.....	.....	.....	.....
Wheeling, W. Va.	102.1	103.9	104.1	104.6	104.3	104.6	100.1	107.6	106.0	109.0	109.7	114.3	116.4	122.7	122.7	122.0	122.1	122.1	122.1
Wilmington, Del.	103.7	100.7	97.5	97.0	97.0	94.2	93.9	107.8	108.6	111.4	119.5	126.6	134.9	.....	135.4	135.4	144.1	144.2	144.1

	1939				1940				1941				1942				1943		
	Mar.	June	Sept.	Dec.	Mar.	June	Sept.	Dec.	Mar.	June	Sept.	Dec.	Mar.	June	Sept.	Dec.	Mar.	June	Sept.
Asheville, N. C.	101.7	97.5	97.1	102.3	100.0	99.6	98.8	106.4	115.1	114.2	115.6	118.8	118.8	120.1	120.1	119.7	.....	.....	.....
Atlanta, Ga.	96.5	95.5	94.9	97.5	97.4	96.5	99.9	112.8	117.3	119.5	123.3	125.0	126.6	129.0	129.1	131.7	136.8	136.7	141.8
Baltimore, Md.	96.8	98.3	97.5	99.6	98.4	98.4	101.8	117.2	126.1	127.6	128.0	130.1	130.6	131.9	132.6	131.9	137.7	144.9	137.7
Birmingham, Ala.	101.9	95.5	92.7	93.4	93.6	91.2	94.0	106.4	108.4	108.3	115.0	115.7	117.4	117.5	117.5	117.5	113.5	116.5	119.5
Boston, Mass.	102.3	100.9	101.7	103.1	104.1	104.0	104.1	107.0	108.5	112.1	114.3	118.0	120.2	123.0	120.1	120.1	122.3	119.8	121.3
Chicago, Ill.	100.4	100.6	99.5	99.8	99.8	99.6	100.6	101.4	104.3	108.4	114.4	115.6	116.7	116.7	118.2	118.2	118.2	118.2	118.2
Columbia, S. C.	101.8	100.6	99.3	98.3	99.5	98.0	98.4	114.7	116.6	120.6	124.9	128.3	131.9	132.2	132.2	132.1	137.1	.....	.....
Cumberland, Md.	100.4	100.6	99.5	99.5	102.3	.....	.....	105.9	110.1	109.1	113.8	114.2	114.1	120.5	122.1	122.1	123.9	126.8	123.9
Denver, Colo.	101.0	101.4	99.8	98.9	98.9	96.8	97.5	100.6	103.3	102.6	107.4	108.5	110.1	110.5	111.8	111.5	110.9	110.9	110.9
Hartford, Conn.	100.5	100.1	100.0	101.1	101.7	103.1	100.8	106.3	110.1	113.4	122.8	123.4	128.3	130.0	129.9	129.9	130.0	130.0	134.2
Manchester, N. H.	100.2	98.8	97.0	97.9	98.1	98.1	98.6	104.6	105.6	107.0	107.1	108.6	108.9	108.9	109.2	109.2	114.1	114.1	113.8
Milwaukee, Wis.	106.7	107.0	106.2	107.9	108.2	108.4	111.6	118.6	120.9	123.5	131.2	133.9	139.8	139.8	145.2	146.2	146.2	146.7	146.7
New Haven, Conn.	99.7	99.1	100.5	102.6	103.6	103.9	103.9	108.4	111.4	117.8	126.3	127.0	129.0	130.9	131.1	131.1	130.5	130.0	132.5
Oklahoma City, Okla.	128.2	127.7	128.4	130.7	131.8	133.3	132.7	156.8	158.4	156.2	162.8	174.4	171.6	178.5	182.0	182.2	182.2	182.2	192.2
Omaha, Nebr.	100.4	100.3	103.1	105.5	106.8	106.4	102.6	103.6	106.7	109.1	108.9	109.1	111.0	112.1	121.1	122.4	122.2	122.2	122.2
Oshkosh, Wis.	101.8	102.7	102.4	100.7	102.5	101.1	101.4	108.6	111.6	112.6	120.1	122.2	125.1	125.2	133.6	133.6	133.6	133.6	133.6
Peoria, Ill.	99.8	101.6	102.9	107.1	108.9	109.8	110.2	110.9	112.6	113.0	119.1	119.4	119.8	119.8	119.8	119.7	119.7	124.1	124.1
Portland, Me.	99.0	99.6	98.8	98.6	98.9	98.9	99.3	99.2	101.0	102.0	102.0	103.3	103.1	103.2	103.6	103.6	117.8	117.8	117.7
Providence, R. I.	103.0	104.0	103.2	104.2	104.6	105.2	106.2	108.0	108.9	110.2	113.6	116.2	118.3	120.1	118.9	118.9	120.8	125.3	127.1
Raleigh, N. C.	100.7	95.0	93.1	99.3	96.1	96.1	99.7	102.8	105.0	105.5	116.7	118.0	125.3	125.3	125.5	125.3	127.5	.....	.....
Richmond, Va.	100.9	98.0	98.9	98.4	96.3	95.7	98.3	107.6	110.6	111.2	118.1	118.0	117.9	119.5	118.6	118.6	118.0	117.8	117.8
Roanoke, Va.	104.5	104.7	104.8	105.5	105.7	105.8	.....	116.1	122.4	120.7	122.6	125.1	128.1	130.4	125.0	125.2	127.2	127.3	127.2
Rutland, Vt.	99.6	98.8	97.5	96.0	96.9	97.0	98.8	99.1	107.1	107.7	115.0	115.8	120.3	121.7	124.4	124.4	124.5	125.2	125.4
Springfield, Ill.	118.0	117.6	117.4	122.5	122.4	123.7	124.1	128.4	129.3	129.3	135.8	136.5	135.5	135.5	134.2	134.2	134.2	139.9	139.9
Tampa, Fla.	100.3	101.0	101.1	103.4	103.9	102.8	103.6	109.2	111.5	111.4	112.0	112.8	113.8	114.0	119.4	.....	124.8	.....	.....
Washington, D. C.	105.8	102.9	104.4	104.4	104.4	104.3	107.2	116.7	113.5	112.3	112.3	116.4	121.6	125.9	125.9	125.9	134.0	135.4	137.1
Wichita, Kan.	109.1	108.0	107.7	103.9	103.3	104.7	.....	102.5	103.8	108.6	109.8	114.3	116.2	117.1	117.8	122.2	123.7	125.3	125.3

Cost Summary of Temporary War-Housing Projects

FOLLOWING table shows total development costs and rage costs per dwelling unit by major cost classifica- s for typical war-housing projects put under contract the Federal Public Housing Authority during the three- nth period ending November 30, 1943. All projects luded in the table are family dwellings of temporary struction and the data show costs at the time of contract award. Variations in project composition, such as the size of families to be accommodated, the type of utilities and equipment installed, the amount of furniture and furnishings provided, if any, and the number of commercial and other project facilities provided, affect the comparability of the individual project costs that are tabulated below:

			Average Cost per Dwelling Unit					
Location of Project	**No. of Dwelling Units**	**Total Development Cost** [1]	**Total Development**	**Dwelling Facilities** [2]	**Non-Dwelling Facilities** [3]	**Site Improvement** [4]	**Site Acquisition** [5]	**Architect., Admin. and Other** [6]
bama								
Enterprise	100	$241,800	$2,418	$1,686	$117	$477	$33	$105
ona								
Douglas	60	150,500	2,508	*1,623	113	552	70	150
Maricopa County District 3	34	95,800	2,818	*1,885	221	518	18	176
lifornia								
San Diego	200	463,800	2,319	*1,674	79	449	15	102
Contra-Costa								
County Township 12	1,000	2,239,400	2,239	*1,558	121	450	47	63
Seneca Township	40	113,800	2,845	*2,070	107	470	25	173
Coronado Island	496	1,112,000	2,242	*1,871	74	210	16	71
San Diego	300	725,600	2,419	*1,296	81	743	213	86
necticut								
Waterbury	140	424,100	3,029	2,116	142	621	26	124
rida								
Pensacola	200	439,000	2,195	1,736	122	254	11	72
Pensacola	80	207,600	2,595	2,021	154	334	5	81
Boca Raton	160	360,400	2,253	1,703	128	326	8	88
Panama City	80	184,200	2,303	1,654	131	392	40	86
eorgia								
Rome	60	157,900	2,632	1,602	213	497	170	150
diana								
Evansville	150	465,500	3,103	2,431	140	365	10	157
uisiana								
New Orleans	500	1,224,200	2,448	*1,870	58	430	22	68
Maine								
South Portland	200	571,300	2,857	2,217	....	492	62	86
South Portland	200	609,400	3,047	2,217	129	549	62	90
Massachusetts								
Falmouth	100	287,700	2,877	2,160	238	328	18	133
Michigan								
Detroit	300	942,300	3,141	*2,398	145	493	8	97
Bay City	250	676,100	2,704	*2,133	85	396	12	78
Ecorse	250	735,600	2,942	2,275	69	484	29	85
Detroit	220	678,600	3,085	*2,438	....	495	52	100
Mississippi								
Grenada	60	155,100	2,585	*1,697	202	582	8	96
Grenada	120	298,200	2,485	*1,674	214	511	8	78
Grenada	60	151,900	2,532	*1,668	207	543	25	89
Nebraska								
Hastings	260	816,400	3,140	2,131	113	730	60	106
Nevada								
Ely Township	100	289,900	2,899	*2,195	128	447	....	129
New Mexico								
Fort Sumner	220	483,800	2,199	*1,566	268	268	6	91
Gallup	125	330,400	2,643	*1,850	84	519	10	180
Ohio								
Bath Township	56[illegible]	1,631,700	2,893	2,014	164	585	59	71
Port Clinton	200	411,500	2,058	1,250	145	570	8	85
Akron	500	1,579,900	3,160	2,517	47	520	29	47
Oklahoma								
McCurtain	220	710,600	3,230	*2,250	211	595	60	114
Carbon	192	582,900	3,036	*2,093	109	656	58	120
South Carolina								
Moncks Corner	40	102,600	2,565	*1,980	7	415	13	150
Charleston	550	1,196,500	2,175	1,700	88	292	42	53
Texas								
Orange	500	1,045,800	2,092	*1,547	62	406	23	54
Dallas	800	1,529,300	1,912	*1,546	6	273	5	82
Grand Prairie	200	368,100	1,840	*1,554	12	147	3	124
Dallas	750	1,542,700	2,056	*1,518	80	384	4	70
Dallas	641	1,239,500	1,933	*1,469	59	325	5	75
Galveston	400	900,200	2,250	*1,729	51	313	90	67
Washington								
Longview	100	221,700	2,217	*1,717	130	236	....	134
Northport	40	118,400	2,960	2,078	220	492	20	150

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[1] Rounded to the nearest hundred dollars; excludes allowances for contingencies.

[2] Cost of dwelling structures including plumbing, heating and electrical costs, and movable equipment such as ranges, refrigerators and portable space heaters. (* furniture and furnishings also included).

[3] Cost of management and maintenance and other non-dwelling buildings, spaces and equipment.

[4] Cost of clearing and general grading, streets and walks, utility mains, including sewers, water, gas and electrical systems, landscaping and other costs of developing the site.

[5] Cost of land and land acquisition expense.

[6] Includes amounts for architectural and engineering services, costs of inspection and supervision on project site, administrative costs of local housing authority that are directly traceable to the project (when developed by a local public housing authority).

Per Capita Water Supply Costs

THE COST OF ADDITIONAL water supply facilities needed in the United States is estimated to be $683,300,000, according to an inventory compiled by the U. S. Public Health Service. Of this total, extensions and improvements in 6,455 communities will represent a cost of $502,340,000, and new systems in 4,863 places will call for the expenditure of $180,960,000.

These findings are contained in a report by H. W. Streeter, sanitary engineer director, and Ray Raneri, passed assistant engineer, U.S.P.H.S., published in the Jan. 7 issue of *Public Health Reports* (Vol. 59, No. 1).

Method of estimating cost

Altogether 865 PWA projects were listed in four categories—44 in treatment, 19 in source and treatment, 781 in completely new systems, and 21 in groundwater supplies. An analysis was then made as shown in Table I, which gives the relation between average size of population groups and corresponding cost of newly constructed water supply facilities.

In discussing costs, the authors point out that following the last war construction costs varied considerably but during the period 1920-30 averaged about 12 percent higher than those prevailing during the war. At the present time, construction costs are about 32 percent higher than in the period 1934-40.

Following the present war, in so far as the experience of the last war is a guide, Messrs. Streeter and Raneri believe it reasonable to expect further increase in cost above the present levels. It is their estimate that costs after the present war would be about 48 percent higher than in the period 1934-40.

In making the cost estimates of future needs, the authors increased the per capita cost indicated in Table I for the period 1933-39 by 32 percent in order to conform to present-day prices.

For the derivation of estimated cost of extensions and improvements to existing waterworks, a general figure of $35 per capita was used, $20 of which was allotted to source and treatment and $15 for distribution system improvements. For purposes of estimating total cost, the per capita costs were applied only to the populations to be benefited by such improvements and not to the total incorporated population figures.

The report points out that the estimates given do not include anything for the addition of water softening facilities. Of the 27,000,000 people i the "hardwater" regions of the Unite States only about 7,000,000 are serve with softened water.

Applied to a population of 20,000,- 000, the total estimated cost would b $120,000,000 for softening of al water supplies not now thus treated.

TABLE I—RELATION BETWEEN AVERAGE SIZE OF POPULATION GROUP AND CORRESPONDING COST OF NEWLY CONSTRUCTED WATER SUPPLY FACILITIES

(Based on Public Works Administration contracts, 1933-39)

Type of facility	Population range	Number of projects	Average population	Average cost per capita
Waterworks systems (complete, including source)....	100–500	246	370	$84.00
	500– 1,000	340	700	65.00
	1,000–10,000	195	1,800	45.00
Treatment works..............................	100– 500	2	384	23.20
	500– 2,000	11	1,130	19.80
	2,000–10,000	23	4,320	15.00
	Over 10,000	8	39,800	9.20
Sources and treatment works combined...........	500– 2,000	4	1,350	28.40
	2,000–10,000	9	5,320	18.40
	Over 10,000	6	120,000	15.50
Groundwater supplies..........................	100– 500	4	430	16.20
	500– 2,000	12	1,230	7.30
	2,000–10,000	5	3,050	5.28

TABLE II—ESTIMATED COST OF PUBLIC WATER SUPPLY FACILITIES TO MEET REQUIRED NEEDS IN VARIOUS STATES

(In thousands of dollars)

State	Development and purification	Distribution system	Total	State	Development and purification	Distribution system	Total
Alabama...........	2,420	4,490	6,910	Nebraska..........	3,640	5,130	8,770
Arizona............	3,200	970	4,170	Nevada...........	80	70	150
Arkansas...........	3,130	6.400	9,530	New Hampshire....	160	280	440
California.........	41,040	5,710	46,750	New Jersey........	3,020	3,630	6,650
Colorado...........	3,750	1,970	5,720	New Mexico.......	610	420	1,030
Connecticut........	1,320	1,990	3,310	New York.........	25,300	12,510	37,810
Delaware..........	280	610	890	North Carolina.....	4,040	7,820	11,860
District of Col......	6,850	5,150	12,000	North Dakota.....	3.060	5.200	8,260
Florida............	2,760	4,100	6,860	Ohio..............	23.600	15.510	39,110
Georgia...........	5,050	7,710	12,760	Oklahoma.........	5,020	10,260	15,280
Idaho.............	960	1,960	2,920	Oregon............	1,590	1,330	2,920
Illinois...........	77,600	18.660	96.260	Pennsylvania......	24.340	11,800	36,140
Indiana...........	7,400	8,390	15,790	Rhode Island......	9,280	860	10,140
Iowa..............	3,460	7,210	10,670	South Carolina.....	1,480	2,770	4,250
Kansas............	3,190	5,070	8,260	South Dakota......	1,550	1,950	3,500
Kentucky..........	5,630	6.520	12,150	Tennessee.........	2,250	3,170	5,420
Louisiana..........	1,410	4,270	5.680	Texas.............	8,650	4,490	13,140
Maine............	1,110	950	2,060	Utah..............	2,330	3,530	5,860
Maryland..........	37.760	9.470	47.230	Vermont..........	1,080	1,780	2,860
Massachusetts......	17,750	3,080	20,830	Virginia..........	2,390	2,110	4,500
Michigan..........	33.670	6,600	40,270	Washington........	4,070	7,070	11,140
Minnesota.........	4,240	7,210	11,450	West Virginia......	1,670	1,480	3,150
Mississippi.........	2,110	3,440	5,550	Wisconsin.........	10,950	10,180	21,130
Missouri..........	16,590	21,450	38,040	Wyoming..........	1,680	350	2,030
Montana..........	230	1,470	1,700				
				Total.........	424,750	258,550	683,300

Contract Unit Bid Prices

Selected list of 65 projects showing how contractors bid in 1943-1944

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AIRPORT, LA CROSSE, WIS.

NER: Civil Aeronautics Administration, Chicago.

OJECT: Construction of airport at La Crosse, Wis., includ- runway, taxiway, and concrete apron. Involves necessary aring and grubbing, drainage structures, grading, fencing, ding and sodding, underground cable ducts, and construc- of entrance driveway. Alternates were allowed on airport ing: Alternate A, 7-in. Class A concrete pavement; and ernate B, bituminous runway and taxiway pavement, and crete apron. Contract awarded on basis of Alternate B.

NDITIONS: Contractor to furnish all materials and com- te all major items of construction in 150 days and all items 180 days. Rail highway and water transportation facilities ilable. Wage rates are: skilled labor, $1.25 to $1.50 per r; semi-skilled, $1.00 to $1.25; and common labor, 90c. tract has been awarded, but construction is not expected begin until April or May. In connection with unit prices mitted on grading items by the low bidder, the owner tes that they were below the average received recently for ilar grading work in this general area.

DS: Twelve bids were received October 29, 1943 on Alter- e B basis of construction. They range from the contract of $925,779 to $1,273,590. Eleven bids were opened the e day on the basis of Alternate A, ranging from the low of 9,526 to $1,457,615.

T OF BIDDERS: (Alternate B, Bituminous Pavement.)

1. ACT Associates, Eau Claire, Wis. (contract)	$925.779
2. Rock Road Constr. Co., Chicago, Ill.	962,250
3. Cheney-Wright Co., Williamston, Mich	968.756
4. Megarry Bros., St. Cloud, Minn	987,122
5. J. Rasmussen & Sons Co., Oshkosh, Wis	988,443
6. Okes Constr. Co., St. Paul, Minn	1,052,229
7. Frank Mashuda Co., Milwaukee, Wis	1,075,015
8. S. J. Groves & Sons Co., Minneapolis, Minn	1,076,761
9. Jay W. Craig Co., Minneapolis, Minn	1,092,513
10. Tobin Quarries, Inc., Kansas City, Mo	1,155,586
11. Concrete Material Constr. Co., Cedar Rapids, Iowa	1,230.463
12. M. J. Boyle & Co., Chicago, Ill	1,273,590

Preparation of Site

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear, grub within grading limits and safety zones	Lump Sum	$10,000.00	$25,000.00	$4,500.00
2. Clearing brush in clearing zones	Lump Sum	5,000.00	1,600.00	1,000.00
3. Clearing trees outside grading limits, safety and clearing zones	2,200 in dia.	.30	.50	.60
4. Grubbing stumps outside grading and safety limits.	500 in. dia.	.40	.40	.20
5. Cleaning homestead sites (16 sites)	Lump Sum	1,600.00	2,300.00	4,800.00
6. Fence removal outside grading limits and safety zones	1,000 rod	.50	.55	.30
7. Grading	1,341,000 c. y.	.22	.21	.22
8. 24-in. (C-76) ext. str. storm sewers	406 l. f.	3.75	5.00	5.00
9. As above, bedded in concrete	466 l. f.	5.25	6.00	6.50
10. Concrete for sewer inlets, headwalls, etc	14 c. y.	30.00	40.00	25.00
11. Dry wells	37 ea.	100.00	115.00	125.00
12. Reinf. steel for drainage struct	1,700 lb.	.15	.10	.10
13. 30-in. concrete grate bars	367 ea.	2.00	2.10	2.00
14. Smoothing field areas outside grading limits	20 ac.	25.00	11.00	25.00
15. Fertilizing	520 ac.	10.00	16.00	12.00
16. Liming	520 ac.	9.00	7.00	11.00
17. Seeding, winter rye	520 ac.	3.00	7.00	5.00
18. Grass seed mixture	520 ac.	9.00	15.00	15.00
19. Sodding	1,430 s. y.	.60	.40	.40
20. 3-in. undergrd cable ducts, one duct bank	4,120 l. f.	1.00	1.25	1.25
21. As above, two duct bank	1,120 l. f.	1.75	2.00	2.00
22. As above, three duct bank	600 l. f.	3.00	2.50	3.00
23. As above, four duct bank	110 l. f.	5.00	3.50	4.00
24. Fencing, Class C	1,150 rod	2.80	4.00	2.50
25. Cr. stone surf., entr. driveway	5,900 s. y.	.60	.60	.50
26. Prime coat, MC-1, entr. driveway	2,350 gal.	.15	.11	.11

(*Continued on page* 168)

AIRPORT, LA CROSSE, WIS. (cont'd)

Paving—Alternate "A", Concrete Pavement

27. 7-in. Cl. A concrete pavement	335,650 s. y.	1.92	....	....

Paving—Alternate "B", Bituminous Runway and Taxiway Pavement and Concrete Apron

28. 6-in. aggregate sub-base course	328,500 s. y.	.60	.63	.60
29. 4-in. waterbound macad. base crse	327,000 s. y.	.47	.47	.45
30. MC-1 prime coat, base crse.	131,000 gal.	.10	.11	.09
31. 2-in. central plant, hot mix, bit. surf. course	29,600 ton	3.50	3.50	4.17
32. 3-in., as above	7,000 ton	3.50	3.85	4.40
33. Asphalt cement, 120-150 pen	496,000 gal.	.08	.10	.10
34. RC-2 seal coat, surf. crse.	82,000 gal.	.11	.12	.11
35. Seal coat aggregate, surf. course	3,250 ton	3.00	2.50	3.80
36. 7-in. Cl. A conc. pavement, apron	10,130 s. y.	2.00	2.25	3.00

AIRPORT IMPROVEMENTS ALEXANDRIA, MINN.

OWNER: Civil Aeronautics Authority, Chicago, Ill.; I. W. Polk, engineer.

PROJECT: Improvements at municipal airport, Alexandria, Minn., involving the preparation of the site; and including paving of two flexible bituminous runways, one 150-ft. wide by 5,700-ft. long, and one 150-ft. wide by 5,400-ft. long. Alternate paving method bids were asked, bituminous or 7-in. concrete.

CONDITIONS: Contractor to furnish all materials and complete work in 150 calendar days. Rail and highway transportation facilities available. Wage rates for skilled labor range from $1.50 to $1.62 per hour; and 60c. is the common rate.

BIDS: Thirteen bids were received on the bituminous paving alternate, ranging from the contract low of $528,571 to $827,353. Thirteen bids were also received March 5, 1943 on the concrete paving, ranging from $751,709 to $1,106,905.

LIST OF BIDDERS:

Schedules I and II (Bituminous Paving)

1. Megarry Brothers, St. Cloud, Minn. (contract)	$528,571
2. DeRuyter Bros. & Thornton Bros., St. Paul, Minn	590,331
3. A. W. Gallagher & Son & Assoc., Madison, Wis	630,022
4. Suburban Oil Co., Oak Park, Ill	635,465
5. Z. G. Arnold, Inc., Camp Douglas, Wis	651,665
6. Dominick Bros., Gilchrist, and J. P. Berghuis, Olivia, Minn.	665,784
7. Albert Lalonde Co., Sidney, Mont	671,778
8. Fielding & Shepley, Inc., St. Paul, Minn	714,790
9. J. L. McLaughlin, Great Falls, Mont	734,826
10. S. J. Groves & Sons Co., Minneapolis, Minn	736,528
11. Lowe Construction Co., Cedar Rapids, Iowa	790,662
12. Carl H. Peterson & Co., Minneapolis, Minn	800,389
13. Jay W. Craig Co., Minneapolis, Minn	827,353

Schedules I and II (Concrete Paving)

1. Hallett Construction Co., Crosby, Minn	$751,709
2. Nelson, Mullen & Webster, Inc., Minneapolis, Minn.	781,791
3. Nelson & Hafner, Contractors, Duluth, Minn	854,637
4. Anderson Bros. & Co., Minneapolis, Minn	884,555
5. DeRuyter Bros. & Thornton Bros., St. Paul, Minn	893,454
6. J. A. Ross & Co., Chicago, Ill	895,773
7. S. J. Groves & Sons Co., Minneapolis, Minn	900,610
8. Z. G. Arnold, Inc., Camp Douglas, Wis	921,439
9. Lowe Construction Co., Cedar Rapids, Iowa	948,710
10. Fielding & Shepley, Inc., St. Paul, Minn	969,712
11. Albert Lalonde Co., Sidney, Mont	994,920
12. Stuparits & Balog, Chicago, Ill	1,087,235
13. Western Contracting Corp., Sioux City, Iowa	1,106,905

Schedule I—Preparation of Site

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing of trees	700 in. dia.	$0.25	$0.45	$0.60
2. Grubbing of stumps	700 in. dia.	.25	.60	.60
3. Remove existing fence	1,500 rd.	.35	.15	.50
4. Remove lighting system	Lump Sum	750.00	950.00	2,600.00
5. Remove strawpiles	2 ea.	15.00	25.00	50.00
6. Remove road culvert	Lump Sum	20.00	50.00	
7. Grading	977,700 c. y.	.22	.27	
8. Watering earth embankment	10,000 M gal.	2.00	2.00	
9. 12-in pipe drains, storm sewers	2,195 l. f.	1.75	2.00	
10. 18-in pipe drains, storm sewers	1,723 l. f.	2.75	3.00	
11. 21-in. pipe drains, storm sewers	600 l. f.	3.60	4.00	
12. Concrete for inlets, headwalls, etc.	29 c. y.	40.00	50.00	
13. Reinf. steel, drainage structure	22 lb.	.15	.10	
14. 30-in. conc. grate bar unit, etc	96 ea.	5.00	3.00	
15. Sumps, in place	5 ea.	150.00	150.00	
16. Fertilizing	190 ac.	8.00	6.00	
17. Seeding	400 ac.	10.00	15.00	
18. Wire electric fence	1,300 rod	1.50	1.65	
19. Wood cattle guard	1 ea.	200.00	200.00	
20. Remove boundary markers	Lump Sum	300.00	300.00	
21. 3-in. underground cable ducts	3,190 l. f.	1.00	1.50	
22. Driveway and parking area ditch excavation	270 c. y.	.30	.50	
23. Driveway and parking area surfacing material	320 c. y.	1.00	1.00	
24. Move and re-establish watch-house.	Lump Sum	300.00	700.00	
25. Concrete for watch-house, foundation, sidewalks, etc	17 c. y	30.00	50.00	
26. Move septic tank and sanitary system	Lump Sum	100.00	300.00	
27. Re-establish water supply	Lump Sum	400.00	500.00	
28. Drilling and casing well	30 l. f.	3.00	4.00	
29. Furn. 4-in. pipe well casing	50 l. f.	1.00	1.50	

Schedule II—Concrete Paving, Alternate A

30. Concrete pavement, 7-in. thick	222,180 s. y.	No Bid	$2.59	

Schedule II—Bituminous Paving, Alternate B

31. 10-in. stab. gravel base course	222,180 s. y.	.65	.45	
32. MC-O prime coat	88,870 gal.	.11	.11	
33. 2-in. compacted hot mix bitum. mat'l., surface course	222,180 s. y.	.25	.48	
34. Asphaltic cement, surface course	444,360 gal.	.10	.10	
35. RC-2 seal coat	44,400 gal.	.11	.11	
36. Sand or chip course	2,200 ton	3.00	3.00	

AIRPORT IMPROVEMENTS ROCKPORT, TEXAS

OWNER: Civil Aeronautics Administration, Fort Worth, Tex.; W. R. Haron, engr.

PROJECT: Construction of airport in Rockport, Aransa County, Tex., including grading (field excavation), so blanket, drainage structures, fencing, seeding, ducts, boundary markers, and surface conditioning. Alternates wer allowed on paving: concrete pavement, shell base course, o rock asphalt base course. Award was made on basis of latter.

CONDITIONS: Contractor to furnish all materials an complete work in 60 calendar days. Rail and highway transportation facilities available. Wage rates specified as minimums are: skilled labor, $1.50 per hour; semi-skilled, 75c.; and common, 50c.

BIDS: Five bids were received on Schedule I (Grading Excavation and Drainage) April 20, 1943, ranging from th contract low of $467,115 to $862,442. On Schedule II (Concrete Pavement) bids ranged from $462,000 to $600,600; an on Schedule III from $361,120 to $522,480. List of bidder and their bid prices are shown with each schedule.

Schedule I—Grading, Drainage and Excavation

LIST OF BIDDERS:

1. Heldenfels Bros., Rockport, Tex. (contract)	$467,11
2. Holland Page, Austin, Tex.	608,57
3. Brown & Root, Inc., Corpus Christi, Tex.	725,65
4. A. J. Spicer, Oklahoma City, Okla.	847,70
5. McKinney Constr. Co., Marshall, Tex.	862,44

Item	Quan.	Unit Prices (1)	(2)
1. Grading (field excavation)	600,000 c. y.	$0.39	$0.47
2. Blanket, soil 3-ft. thick	200,000 c. y.	.68	.79
3. 24-in. pipe drains, incl. tr. and bkfill	2,700 l. f.	3.75	4.25
4. 30-in. pipe, as above	830 l. f.	4.50	5.75
5. 33-in. pipe, as above	420 l. f.	5.00	7.10
6. 36-in. pipe, as above	1,300 l. f.	6.00	8.30
7. 42-in. pipe, as above	1,260 l. f.	7.00	10.40
8. 48-in. pipe, as above	700 l. f.	8.50	14.00
9. 54-in. pipe, as above	2,090 l. f.	10.50	18.60
10. Catch basin grates, wood	80 ea.	20.00	25.00
11. Catch basin grates, concrete	225 c. y.	35.00	40.00
12. Install headwalls	5 ea.	140.00	75.00
13. Ditch excavation	71,000 c. y.	.20	.47
14. Seeding	320 acre	8.00	46.00

(Continued on page 170)

Water-Water everywhere
but
not
a
drop
to
drink
OWEN

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AIRPORT, ROCKPORT, TEX. (cont'd.)

15. Fence, Class D	1,000 rod	1.80	5.00	1.38
16. 12-ft. wooden gate	1 ea.	40.00	50.00	79.20
17. 3-in. duct	4,600 l. f.	.50	1.13	.66
18. Boundary markers	49 ea.	35.00	40 00	29.04
19. Concrete (1:2:4 mix)	10 c. y.	35.00	30 00	31.68
20. Conditioning surface	10 ac.	40 00	30.00	26.40
21. Rock riprap	500 c. y.	6.20	9.00	8.58
22. 3-in. soil blanket	50,000 c. y.	.75	....	1.10
23. Shell blanket, 3-in	150,000 c. y.	.95	....	1.35

Schedule II—Concrete Pavement

LIST OF BIDDERS:

1. H. B. Zachry Co., San Antonio, Tex.	$462,000
2. Holland Page, Austin, Tex.	506,880
3. Brown & Root, Inc., Corpus Christi, Tex	554,400
4. Heldenfels Bros., Rockport, Tex.	557,040
5. A. J. Spicer, Oklahoma City, Okla.	600,600

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Concrete pavement	264,000 s. y.	$1.75	$1.92	$2.10

Schedule III—Base Course

1. Heldenfels Bros., Rockport, Tex., (contract) (rock asphalt)	$361,120
(shell)	377.280
2. Holland Page, Austin, Tex. (rock asphalt)	412.010
3. Brown & Root, Inc., Corpus Christi, Tex. (shell)	451,320
4. McKinney Constr. Co., Marshall, Tex. (shell)	522,480

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Base course aggregate	92,000 c. y.	$2.15	$2.54	$2.95
2. Asphalt, base course	100,000 gal.	.10	.11	.13
3. 2-in. surface course, (shell) aggregate	29,000 ton	5.20	No Bid	5.20
4. Seal coat	2,800 ton	4.00	No Bid	2.64
5. Asphalt, seal coat	68,000 gal.	.11	No Bid	.13
6. Asphalt aggregate, 2-in. Uvalde rock asphalt	26,400 ton	5.10	5.50	No Bid
7. Seal coat	2,800 ton	4.00	5.00	No Bid
8. Seal coat, asphalt	68,000 gal.	.11	.12	No Bid

AIRPORT CONSTRUCTION, TEXAS

OWNER: Civil Aeronautics Administration, Fort Worth, Tex.

PROJECT: Clearing, grading, fencing, paving, conditioning and lighting at the El Paso Municipal Airport, El Paso, Tex. Includes preparation of site; constructing flexible base runways and taxiways, 9-in. caliche base course and 2-in. bituminous surface course with seal coat; and removing, replacing and installing new airport lighting equipment.

CONDITIONS: Government to furnish series flush type contact light with lens, filter and cover; series boundary light units; filters, contact light units; cable, both single and double conductor; cutout with special mounting straps; wind tetrahedron; runway selector relays; lamps; control panel; and transformer or other major vault unit if required. Contractor to furnish all other materials and complete work as follows: Schedule I, 90 calendar days; Schedule II, 150 calendar days; and Schedule III, 120 calendar days. Part of airport site must remain open for air training and traffic during the construction period. Highway and spur track of Southern Pacific Railroad available for transportation of materials. Wage rates are: skilled labor, $1.00 to $1.50 per hour; semi-skilled, 60 to 75c.; and common, 50c.

BIDS: Eight bids were opened August 20, 1943 on Schedule I ranging from the low of $71,780 to $134,721; eight bids were received on Schedule II on the same date, ranging from $733,800 to $1,526,450; and thirteen bids were received on Schedule III ranging from $27,296 to $65,592. On Schedule II an alternate was allowed on paving: 2-in. bituminous surface course, or 2-in. natural rock asphalt. Award recommended on former basis. One bid received on the latter, $804,570. Unit prices are tabulated below along with the list of bidders on each schedule.

Schedule I—Preparation of Site

LIST OF BIDDERS: (Engineers estimate, $90,540.)

1. Uvalde Constr. Co., Dallas, Tex. (recommended award)	$71,780
2. Holland Page, Austin, Tex	86,6
3. Brazos Valley Construction, Mineral Wells, Tex	86,6
4. Brown & Root, Houston, Tex	93,
5. A. O. Peabody, Santa Fe, N. M.	111,
6. McKinney Constr. Co., Marshall, Tex	112,
7. Gaylord Constr. Co., Houston, Tex	130,0
8. Lee Moor-Tanner Co., El Paso, Tex	134,7

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	250 ac.	$20.00	$40.00	$40
2. Grading (field excavation)	180,000 c. y.	.30	.30	[illegible]
3. Fence Class D	700 l. rd.	1.60	2.00	[illegible]
4. New fence	400 l. rd.	2.75	3.50	[illegible]
5. Install 3-in. duct	18,000 l. f.	.52	1.00	[illegible]
6. Concrete (1:2:4 mix)	20 c. y.	50 00	50 00	[illegible]
7. Rock excavation	100 c. y.	1.20	4 00	[illegible]
8. Conditioning surface	10 ac.	8.00	25.00	[illegible]

Schedule II—Paving

LIST OF BIDDERS: (Engineers estimate, $953,120.)

1. Uvalde Constr. Co., Dallas, Tex. (recommended award)	$733,80
2. McKinney Constr. Co., Marshall, Tex.	806,86
3. Lee Moor-Tanner Co., El Paso, Tex.	812,78
4. A. O. Peabody, Santa Fe, N. M.	860,26
5. Brown & Root, Houston, Tex	898,91
6. Jay W. Craig Co., Minneapolis, Minn	933,13
7. Thomas & Ratliff, Rogers, Tex.	1,357,81
8. Gaylord Constr. Co., Houston, Tex	1,526,45

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Base course aggregate	133,000 c. y.	$1.96	$2.25	[illegible]
2. Asphalt base course	145,000 gal.	.11	.104	[illegible]
3. Aggregate (bitum. mix) 2-in. surf. crse	70,000 ton	4.15	4.74	[illegible]
4. Seal coat	5,000 ton	5.50	5.05	[illegible]
5. Asphalt, seal coat	150,000 gal.	.10	.10	[illegible]
6. Caliche blanket (compacted shldrs.)	770,000 s. y.	.095	.10	[illegible]
7. Prime coat, asphalt	192,000 gal.	.11	.104	[illegible]
8. Seal coat, asphalt	154,000 gal.	.10	.10	[illegible]
9. Seal coat, course sand	5,800 c. y.	2.50	1.40	[illegible]
10a. Caliche blanket (caliche area)	2,770,000 s. y.	.0865	.10	[illegible]
11a. Prime coat, asphalt	700,000 gal.	.11	.103	[illegible]
12a. Seal coat, asphalt	550,000 gal.	.10	.098	[illegible]
13a. Seal coat, fine aggregate	14,000 c. y.	2.46	1.35	[illegible]

a—Denotes alternate item bids and quantities.

Schedule III—Lighting

LIST OF BIDDERS: (Engineers estimate, $45,400.)

1. Reynolds Electr. & Engr. Co., El Paso, Tex. (recommended award)	$27,296
2. Callaghan Electric, El Paso, Tex	31,518
3. Schanche Construction, St. Louis, Mo.	32,135
4. Lee Moor-Tanner Co., El Paso, Tex	33,467
5. N. E. Busby, Dallas, Tex	34,816
6. Sanford Constr. Co., Oklahoma City, Okla	37,048
7. Empire Electric, Fort Worth, Tex	38,460
8. Uvalde Constr. Co., Dallas, Tex.	38,485
9. Embry Electric Co., Brady, Tex	39,965
10. Nola Electric, New Orleans, La	41,492
11. Nelson Electric, El Paso, Tex	49,200
12. Aaron J. Commer, Roanoke, Va	57,120
13. William & Whittle, Dallas, Tex.	65,592

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove wind tee equipment	Lump Sum	$72.69	$40.41	[illegible]
2. Install wind direction tetrahedron, incl. bkfill, conc. base, etc	Lump Sum	205.13	58.30	[illegible]
3. Disconnect, remove boundary light cones; replace at new location	30 ea.	12.43	10.36	[illegible]
4. Inst. series disconnecting cone-type boundary lights, incl. conc. base, excavating, etc	56 ea.	16.50	19.46	[illegible]
5. Disconnect, remove flood light units, with conc. base, etc	8 ea.	128.20	234.08	[illegible]
6. Disconnect, remove contact light units with base; replace in new location	10 ea.	38.94	24.66	[illegible]
7. Inst. flush type series contact lights, incl. conc. materials, etc	460 ea.	26.45	22.63	[illegible]
8. Excavation, backfill trench, removing salvaging, sealing, coiling and marking exist. underground cable	11,000 l. f.	.1045	.11	[illegible]
9. Excavating and backfilling trench for single or multiple installation of cable, min. depth 18-in	125,000 l. f.	.05	.08	[illegible]
10. Install cable in trench	150,000 l. f.	.0173	.015	[illegible]
11. Replace control panel	Lump Sum	166.82	200.00	[illegible]
12. Install concrete manhole	Lump Sum	385.72	230 00	[illegible]
13. Connect circuits	Lump Sum	442.96	2,200.00	[illegible]
14. Rock excavation	200 c. y.	1.50	4.00	[illegible]
15. Concrete (1:2:4 mix)	50 c. y.	16.98	12.00	[illegible]

AIRPORT CONSTRUCTION MARTINSBURG, W. VA.

ER: Civil Aeronautics Admin., First Region, LaGuar-ield, N. Y.

JECT: Construction of two runways 5,000-ft. by 150-ft. axiways 2,000-ft. by 50-ft., together with the necessary including grading, draining and paving. Work is d at the Martinsburg Municipal Airport in Berkeley ty, about four miles southwest of Martinsburg, W. Va. were asked on both bituminous and concrete paving for rt. Results of bidding on both types of pavement are in the tabulation below.

DITIONS: Contractor to furnish all materials with the ption of 100 feet of 24-in. pipe which is to be removed existing line and relaid. Time for completion: Schedule calendar days; Schedules II and III, 60 calendar days. e to begin operation of contract is expected to be given spring of 1944. Rail and highway transportation facili-vailable. Wage rates are: skilled labor, $1.00 to $1.50 hour; semi-skilled, 80 to 87½c.; and common, 66c.

: Bids were opened December 15, 1943. Nineteen bids chedule I, Preparation of Site, ranged from $524,465 to 975; twenty-five bids on Schedule II, Paving (concrete), ed from $409,100 to $596,500; and twenty-one bids on dule III, Paving (bituminous), ranged from $414,724 to 660. Engineer's estimates were: Schedule I, $655,281; dule II, $477,500; and Schedule III, $491,890. Contract yet awarded.

Schedule I—Preparation of Site

OF BIDDERS: Completion time, 150 Calendar days.

Lane Constr. Corp., Meriden, Conn. (low bidder)	$524,465
F. D. Kessler, Inc., Northumberland, Pa.	624,450
John Arborio, Inc., Poughkeepsie, N. Y.	626,490
C. W. Good, Inc., Lancaster, Pa.	637,271
Walker Bros., Chambersburg, Pa.	637,652
Larkins Co., Inc., Camp Hill, Pa.	660.588
Bero Engr. & Constr. Corp., Buffalo, N. Y.	697,510
The Grandview Co., Mt. Vernon, N. Y.	698,596
F. D. Cline, Raleigh, N. C.	699,773
Peter Mitchell, Inc., and Paul Bacco & Son, Inc., Greenwich, Conn.	702,040
F. S. Tillman, Dayton, Ohio	703,169
Frank Stento & Son, Binghamton, N. Y.	852,741
S. J. Groves & Sons Co., Ridgefield, N. J.	875,126
Del Balso Contsr. Corp., New York, N. Y.	891,630
Rusciano & Son Corp., Bronx, N. Y.	892,294
Potts & Callahan Contract. Co., Inc., Baltimore, Md	893,281
Central Pennsylvania Quarry, Stripping & Constr. Co., Hazleton, Pa.	938,538
Reiss & Weinsier, Inc., Brooklyn, N. Y. and Tufano Contr'g. Corp., Jamaica, N. Y.	940,683
John B. Schultz Contr'g. Co., Inc., Buffalo, N. Y.	988,975

Item	Quan.	Unit Prices (1)	(2)	(3)
aring and grubbing	Lump Sum	$15,000.00	$5,000.00	$10,000.00
ar and grub, if ordered	2 ac.	400.00	400.00	200.00
aring	5 ac.	300.00	200.00	200.00
classified excavation	700.000 c. y.	.53	.70	.61
n. drainage pipe, open joint	7,600 l. f.	.70	.50	.70
-in. drainage pipe, open joint	4,600 l. f.	.80	.60	.85
-in. drainage pipe, open joint	5,300 l. f.	.95	1.00	1.05
-in. drainage pipe, open joint	3,400 l. f.	1.25	1.25	1.30
-in. drainage pipe, open joint	2,700 l. f.	1.65	2.00	1.50
-in. drainage pipe, open joint	1,450 l. f.	2.00	2.50	2.00
cavation for drainage	6,000 c. y.	4.00	2.00	5.00
mpacted earth backfill	500 c. y.	4.00	3.00	2.00
rous backfill	5,500 c. y.	5.00	4.00	5.00
n. drainage pipe, sealed joint	1,700 l. f.	.80	.50	80
-in. drainage pipe, sealed joint	1,250 l. f.	1.25	1 0	1.50
-in. encased pipe, sealed joint	100 l. f.	5.00	6.00	10.00
-in. drainage pipe, sealed joint	950 l. f.	1.75	1.35	2.30
-in. encased pipe, sealed joint	600 l. f.	5.50	6.50	13.00
-in. drainage pipe, sealed joint	310 l. f.	2.25	2.25	3.00
-in. encased pipe, sealed joint	60 l. f.	6.50	8.00	20.00
-in. drainage pipe, sealed joint	360 l. f.	3.00	3.00	3.20
22. 24-in. drainage pipe, sealed joint	210 l. f.	3.75	3.50	3.75
23. 30-in. drainage pipe, sealed joint	500 l. f.	5.00	5.00	5.00
24. 36-in. drainage pipe, sealed joint	780 l. f.	7.50	8.00	7.00
25. Unclassified excav. for drainage	2,800 c. y.	4.00	3.00	5.00
26. Remove, relay exist. 24-in. pipe	100 l. f.	1.75	3.00	5.00
27. Uncl. excav. for removing, relaying pipe	50 c. y.	4.00	2.00	6.00
28. Pipe spillway	300 l. f.	2.50	5.00	10.00
29. Manhole, solid covers	14 ea.	150.00	200.00	300.00
30. Manhole, grate covers	71 ea.	150.00	150.00	300.00
31. Catchbasins	85 ea.	65.00	150.00	175.00
32. Concrete for headwalls	50 c. y.	27.00	30.00	50.00
33. Change elevation, catchbasins	2 ea.	30.00	50.00	250.00
34. Excavation for french drains	50 c. y.	4.00	3.00	5.00
35. Porous backfill, french drains	50 c. y.	5.00	3.00	5.00
36. Grouted stone riprap	500 s. y.	2.25	3.00	6.00
37. Sodding for berm protection	2.500 s. y.	1.00	1.00	2.00
38. 3-in. fiber underground ducts	2,500 l. f.	.50	2.00	3.00

Schedule II—Airport Paving (concrete)

LIST OF BIDDERS: Completion time, 60 calendar days.

1.	Lane Construction Corp., Meriden, Conn. (low bidder). (Only in combination with Schedule I)	$409,100
2.	Union Paving Co., Philadelphia, Pa.	422,200
3.	Peter Mitchell, Inc., and Paul Bacco & Son, Inc., Greenwich, Conn.	423,500
4.	DuBois Constr. Corp., New York, N. Y.	428,670
5.	Larkins Co., Inc., Camp Hill, Pa.	443,300
6.	Walker Brothers, Chambersburg, Pa.	450,760
7.	F. D. Cline, Raleigh, N. C.	447,400
8.	W. H. Armstrong Co., Inc., Washington, D. C.	448,950
9.	Lane Construction Corp., Meriden, Conn. (Schedule II only)	452,300
10.	S. J. Groves & Sons Co., Ridgefield, N. J.	469,000
11.	L. G. DeFelice & Son, Inc., North Haven, Conn.	472,600
12.	Reiss & Weinsier, Inc., Brooklyn, N. Y., and Tufano Contracting Corp., Jamaica, N. Y.	484,950
13.	D. V. Frione & Co., Inc., New Haven, Conn.	485,200
14.	Rusciano & Son Corp., Bronx, N. Y.	490,100
15.	F. D. Kessler, Inc., Northumberland, Pa.	495,500
16.	Potts & Callahan Contracting Co., Inc., Baltimore, Md.	495,500
17.	John B. Schultz Contracting Co., Inc., Buffalo, N. Y.	495,600
18.	F. S. Tillman, Dayton, Ohio	500.900
19.	Seaboard Constr. Corp., Philadelphia, Pa.	501,900
20.	Bero Engr. & Constr. Corp., Buffalo, N. Y.	513,825
21.	John Arborio, Inc., Poughkeepsie, N. Y.	522,500
22.	Union Building & Constr. Corp., Passaic, N. J.	528,150
23.	Robert W. Cleveland & Co., East Orange, N. J.	536.900
24.	The Grandview Co., Mt. Vernon, N. Y.	537,900
25.	John M. Francesa, Charleston, W. Va	596,500

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Unclassified excavation	500 c. y.	$1.00	$2.00	$1.00
2. 8-in. concrete paving, Class A	180,000 s. y.	2.27	2.34	2.35

Schedule III—Airport Paving (bituminous)

LIST OF BIDDERS: Completion time, 60 calendar days.

1.	Lane Constr. Corp., Meriden, Conn. (low bidder). (Only in combination with Schedule I)	$414,724
2.	Bero Engr. & Constr. Corp., Buffalo, N. Y.	429,290
3.	Larkins Co., Inc., Camp Hill, Pa.	434,445
4.	Walker Brothers, Chambersburg, Pa.	449,100
5.	Peter Mitchell, Inc., and Paul Bacco & Son, Inc., Greenwich, Conn.	450,333
6.	Lane Constr. Corp., Meriden, Conn. (Schedule III only)	456,674
7.	Potts & Callahan Contr. Co., Inc., Baltimore, Md.	461,350
8.	Del Balso Constr. Corp., New York, N. Y.	462,863
9.	R. B. Tyler Co., Monroe, N. Y	463,360
10.	F. D. Cline, Raleigh, N. C.	467,921
11.	Robert W. Cleveland & Co., East Orange, N. J.	489,310
12.	Standard Bitulithic Co., New York, N. Y.	489.734
13.	John B. Schultz Contr. Co., Inc., Buffalo, N. Y.	500,995
14.	Murphy Constr. Co., Morgantown, W. Va.	512,700
15.	Allegheny Asphalt & Paving Co., Pittsburgh, Pa.	524,350
16.	Union Building & Constr. Corp., Passaic, N. J	526,636
17.	F. D. Kessler, Inc., Northumberland, Pa.	528,790
18.	Union Paving Co., Philadelphia, Pa.	531,053
19.	John M. Francesa, Charleston, W. Va.	583,780
20.	Reiss & Weinsier, Inc., Brooklyn, N. Y., and Tufano Contr. Corp., Jamaica, N. Y.	644,720
21.	John Arborio, Inc., Poughkeepsie, N. Y.	784,660

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Unclassified excavation	500 c. y.	$1.00	$1.65	$1.00
2. 8-in. conc. pavement, parking area	3,500 s. y.	3.50	3.20	3.60

(Continued on page 174)

AIRPORT, MARTINSBURG, W. VA. (cont'd)

3. Emulsified asphalt, 3-in. base crse...	400,000 gal.	.10	.12	.12
4. Coarse aggregate, 3-in. base crse....	20,000 ton	2.30	2.35	2.54
5. Choke aggregate, 3-in. base crse.....	2,500 ton	3.50	3.25	2.38
6. Key stone, 3-in. base crse..........	3,100 ton	3.50	3.25	2.41
7. Coarse aggregate, dry bnd. mac. base crse..........................	61,000 ton	2.22	2.30	2.41
8. Screenings, dry bnd. mac. base crse..	23,000 ton	2.40	2.35	2.38
9. Aggregate, 1½-in. surf. crse........	12,500 ton	4.30	4.50	4.34
10. Bituminous mat'l., surf. crse........	900 ton	19.30	20.25	20 25
11. Aggregate, 3-in. surf. crse..........	4,600 ton	4.30	4.50	4.34
12. Bituminous mat'l., 3-in. surf. crse..	280 ton	19.30	20.25	20.25
13. Bitum. mat'l., seal coat............	36,000 gal.	.10	.12	.14
14. Cover aggregate, seal coat..........	1,300 ton	4.50	3.50	3.25

AIRPORT PAVING AND DRAINAGE WOODBINE, N. J.

OWNER: Civil Aeronautics Administration, First Region, LaGuardia Field, N. Y.

PROJECT: Clearing, grubbing, grading, draining and paving the Woodbine, N. J. Airport, consisting of clearing, grubbing and grading portions of the entire airport area, placing field and outfall drainage constructing drainage and placing 7-in. concrete pavement for three runways 2,500 ft. long by 150 ft. wide, together with necessary taxiways and apron, and other appurtenant work.

CONDITIONS: Contractor to furnish all materials and complete work on Schedule I in 45 calendar days and work on Schedule II in 40 calendar days. Railroad and highway transportation facilities available. Rider on wage rates not yet issued, but contractor is to pay prevailing wages to all classes of labor.

BIDS: Thirteen bids were received August 27, 1943 on Schedule I, ranging from the contract low of $215,699 to $313,967. Engineers estimate, $246,867. On Schedule II, fifteen bids were opened on the same date, ranging from the contract low of $353,000 to $473,000. Engineers estimate, $375,500. Two bidders submitted identical low bids for Schedule II, $353,000, but as one was the low bidder on Schedule I, the award was to him. Award total for combined schedules is $568,699.

Schedule I—Preparation of Site

LIST OF BIDDERS:

1. The Grandview Co., Mt. Vernon, N. Y. (contract)	$215,699
2. Peter Mitchell Inc., and Paul Bacco & Sons, Inc., Greenwich, Conn.	218,874
3. Harry Eisenberg, Inc., Westmont, N. J	232,597
4. John Arborio, Inc., Poughkeepsie, N. Y	237,669
5. Frank Stento & Sons, Binghamton, N. Y	243,612
6. Spiniello Constr. Co., and Joseph Nesto & Co., Newark, N. J	261,210
7. Robert W. Cleveland & Co., East Orange, N. J	275,155
8. Woodcrest Constr. Co., Inc., and Rosoff Bros., New York, N. Y	286,799
9. Central Pennsylvania Quarry, Stripping & Constr. Co., Hazleton, Pa.	289,796
10. Edward Acker Co. & Tuckahoe Constr. Co., Tuckahoe, N. Y.	290,402
11. Triangle Contracting Co., Newark, N. J	298,366
12. Michael J. Terpey, Inc., Woodside, N. Y	313,543
13. E. W. Foley, Inc., Brooklyn, N. Y	313,967

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing...........	Lump Sum	$28,000.00	$20,750 00	$25,250.00
2. Clear. and grub., if ordered.......	10 ac.	140.00	150.00	250.00
3. Clear approach zones and obstruction areas....................	175 ac.	130.00	75.00	100.00
4. Earth excavation................	200,000 c. y.	.30	.41	.41
5. 8-in. vitr. tile pipe, open joint.....	12,360 l. f.	.60	.50	.65
6. 12-in. vitr. tile pipe, open joint....	1,500 l. f.	1.08	.75	1.05
7. 15-in. concrete pipe, open joint....	2,600 l. f.	1.40	.85	1.25
8. 18-in. concrete pipe, open joint....	2,000 l. f.	1.90	1.10	1.50
9. 21-in. concrete pipe, open joint....	1,300 l. f.	2.76	1.75	1.95
10. 24-in. concrete pipe, open joint....	1,000 l. f.	3.24	2.25	2.40
11. 8-in. vitr. tile pipe, sealed joints...	1,400 l. f.	.65	.65	.80
12. 12-in. vitr. tile pipe, sealed joints..	260 l. f.	1.20	1.10	1.35
13. 15-in. vitr. tile pipe, sealed joints..	100 l. f.	1.50	1.65	1.92
14. 18-in. vitr. tile pipe, sealed joints..	800 l. f.	2.10	2.15	2.55
15. 21-in. vitr. tile pipe, sealed joints..	700 l. f.	2.85	2.90	3.35
16. 24-in. vitr. tile pipe, sealed joints..	400 l. f.	3.30	3.60	4.25
17. 27-in. rein. conc. pipe, sealed joints.	50 l. f.	4.92	3.35	
18. 30-in. rein. conc. pipe, sealed joints.	900 l. f.	5.58	3.85	
19. 36-in. rein. conc. pipe, sealed joints.	50 l. f.	7.50	5.15	
20. 42-in. rein. conc. pipe, sealed joints.	650 l. f.	9.00	6.00	
21. 48-in. rein. conc. pipe, sealed joints.	600 l. f.	10.26	7.05	
22. 54-in. rein. conc. pipe............	450 l. f.	16.62	9.75	
23. Excavation for drainage..........	12,000 c. y.	.70	1.50	
24. Compacting earth backfill........	8,000 c. y.	.50	.75	
25. Porous backfill..................	3,200 c. y.	4.00	1.50	
26. Concrete for headwalls...........	60 c. y.	40.00	30.00	
27. Manholes, Type A, solid covers...	4 ea.	225.00	150.00	
28. Manholes, Type A, grate covers...	8 ea.	225.00	150.00	
29. Manholes, Type B, grate covers...	60 ea.	145.00	150.00	
30. Catchbasins....................	70 ea.	75.00	100.00	
31. Stone riprap....................	20 c. y.	18.00	20.00	
32. Placing sod for berm protection...	27,000 s. f.	.07	.25	
33. Underground ducts..............	4,500 l. f.	.50	1.50	

Schedule II—Airport Paving

LIST OF BIDDERS:

1. The Grandview Co., Mt. Vernon, N. Y. (contract)	$353
2. Woodcrest Constr. Co., Inc., and Rosoff Bros., Inc., New York, N. Y	353
3. DuBois Constr. Co., New York, N. Y	365
4. George & Lynch, Wilmington, Del	360
5. Peter Mitchell, Inc., and Paul Bacco & Sons, Inc., Greenwich, Conn.	374
6. Edward Acker Co. and Tuckahoe Constr. Co., Tuckahoe, N. Y	390
7. Frank Stento & Sons, Binghamton, N. Y	405
8. Alcan Construction Co., Mt. Vernon, N. Y	416
9. Union Paving Co., Philadelphia, Pa	423
10. E. W. Foley, Inc., Brooklyn, N. Y	428
11. John Arborio, Inc., Poughkeepsie, N. Y	431
12. Triangle Contracting Co., Newark, N. J	443
13. James A. Monroe & Sons, North Attleboro, Mass	458
14. Robert W. Cleveland & Co., East Orange, N. J	459
15. Central Pennsylvania Quarry, Stripping & Construction Co., Hazleton, Pa.	473

Item	Quan.	Unit Prices (1)	(2)
1. Earth excavation................	500 c. y.	$1.00	$1.00
2. 7-in. cement conc. pavement.......	150,000 s. y.	2.35	2.35

AIRPORT, FLORIDA

OWNER: Civil Aeronautics Administration, Atlanta, Ga.

PROJECT: Grading, drainage, grubbing, fencing, seed (Schedule I) and paving (Schedule II) of Titusville-Co Airport, eight miles south of Titusville, Brevard County, Includes paving of four 5,000-ft. runways, and clearing of acres. Runway and taxiway base to consist of crushed coq rock, water bound, with 1½-in. hot mix surface; or 8-in. li rock base course as shown in alternates in tabulation of prices below. Coquina rock for base varies in thickness may require extensive quarrying operations.

CONDITIONS: Contractor to furnish all material and co plete entire project in 150 calendar days (130 days for Sch ule I; 90 days for Schedule II). Highway transportation fa ties available adjacent to project; railroad facilities eight mi from site. Wage rates are: skilled labor, $1.125 to $1.375 hour; semi-skilled, 50c. to $1.00; and common, 50c.

BIDS: Six bids were received August 5, 1943 on Schedule ranging from the contract low of $405,626 to $498,711. En neer's estimate, $396,552. On Schedule II (no award as nine bids were received on the same date, two on the coq rock alternate, and seven on the limerock base course altern They range from the low of $554,578 to $901,380.

Schedule I—Preparation of Site

LIST OF BIDDERS:

1. Simpson Constr. Co., Daytona Beach, Fla. (contract)
2. B. B. McCormick & Sons, Jacksonville, Fla
3. The Grandview Co., Mt. Vernon, N. Y
4. R. A. Bowen, Macon, Ga
5. Hall & Caddell, Jacksonville, Fla
6. Marion Contracting Co., Ocala, Fla

(*Continued on page* 176)

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AJOR APPLICATIONS

ECONDARY APPLICATIONS

	CONSTRUCTION							GOVERNMENTAL					RAILROADS			INDUSTRY		
	EARTHMOVING	BRIDGE	PAVING	HIGHWAY	LEVEE	BUILDING	PIPE LINE	FEDERAL	STATE	COUNTY	TOWNSHIP	CITIES	CONSTRUCTION	MAINTENANCE	OPERATION	FACTORIES	DOCKS & WHARFS	COAL HANDLING
ER C TOURNAPULL** (ty-15 heaped yards)	★		●	★	★			★	★	★		●	★					★
ER C TOURNACRANE** (Capacities up to 20,000 lbs.)	●	●	●	★		★	★	★	●	●		●	●	●	★	●		
ER C TOURNATRAILER** (ty-17 heaped yards)	★		●	★	★	●	●	★					●					★
DEL D TOURNAPULL † (ty-2.3 heaped yards)	●		★	●				★	★	★	★	★	★	★				●
DEL D TOURNACRANE † (Capacities up to 10,000 lbs.)			★	●		★	●	★	●	★	★	★	●	●	★	★	★	
DEL D TOURNATRUCK † (ties-5 tons)	●		★	●		★	●	★		★	★	★	●		●	★	★	
ER CONTROL UNITS (for all ler" tractors; Allis-Chalmers L, L-O, HD-14, S, SO; International TD40, TD18, TD14, D, FG, DD, DG, CG)	★	★	★	★	★	●	★	★	★	★	★		★	★	★	★	★	★
RYALL SCRAPERS (tractors fitted with PCU's)	★	●	●	★	★	★		★	★	★	★	●	★	★				★
TERS (tractors fitted with PCU's)	★			★	★		●	★	★	★	●		★	●				
CTOR CRANES (tractors fitted with PCU's)	●	★	●	●		★	★	★	●	●		●	●	●	★	★	★	
ERS ("Caterpillar" tractors)	★	★	★	★	★	●	★	★	★	★	●	●	★	★	★	●		●
EP'S FOOT ROLLERS (tractors)	★		★	★	★			★	★	★			★					

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† 2.3-yd. Carryall Scraper, Tournacranes (4,000 to 10,000 lbs. lifting capacities) and 5-ton Tournatruck interchangeable on same Model D Tournapull prime mover.

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AIRPORT, FLORIDA (cont'd)

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clear, grub and plow	335 ac.	$150.00	$240.00	$230.00
2. Clear airport area	217 ac.	85.00	125.00	150.00
3. Clear outside airport	100 ac.	85.00	125.00	140.00
4. Grading	540,000 c. y.	.26	.31	.30
5. Borrow	10,000 c. y.	.38	.31	.45
6. 10-in. conc. drain lines	200 l. f.	1.30	1.75	1.10
7. 12-in. conc. drain lines	4,770 l. f.	1.55	2.00	1.65
8. 15-in. conc. drain lines	4,020 l. f.	2.40	2.25	2.30
9. 18-in. conc. drain lines	3,520 l. f.	3.15	3.00	2.70
10. 24-in. conc. drain lines	3,540 l. f.	4.35	4.50	4.10
11. 30-in. conc. drain lines	670 l. f.	6.60	5.50	6.00
12. Type A catchbasins, in place	36 ea.	100.00	140.00	150.00
13. Type B catchbasins, in place	20 ea.	165.00	200.00	200.00
14. Type C catchbasins, in place	1 ea.	210.00	300.00	300.00
15. Concrete, headwalls (1:2:4)	100 c. y.	35.00	40.00	40.00
16. 6-in. open joint tile sub-drain	500 l. f.	1.00	1.50	1.50
17. Conditioning	225 ac.	35.00	60.00	50.00
18. Muck excavation and storage	5,000 c. y.	.45	.50	.40
19. 1½-in. muck blanket	5,000 c. y.	.50	.50	.45
20. 1½-in muck blanket (from airport property)	20,000 c. y.	.50	.90	.70
21. 1½-in. muck blanket (outside airport property)	20,000 c. y.	.60	1.00	1.00
22. Fertilize and seed	225 ac.	50.00	60.00	70.00
23. Fertilize and sprigg	225 ac.	100.00	125.00	110.00
24. Watering	6,110 M gal.	2.50	2.00	2.00
25. Class C fence	1,350 rd.	4.50	5.00	5.00
26. 12-ft. steel gate	2 ea.	75.00	75.00	70.00
27. Cattleguard, in place	1 ea.	125.00	300.00	200.00
28. 3-in. underground duct	11,200 l. f.	1.30	1.00	1.10
29. Stabilizing material	15,500 ton	3.75	1.00	1.50

Schedule II—Paving

LIST OF BIDDERS:

Alternate II—8-in. Crusher Run Coquina Rock

1. John Monaghan, Inc., Pellham, Ga. (low bidder)	$554,578
2. Jay W. Craig Co., Minneapolis, Minn	662,140

Alternate I—8-in. Limerock Base Course

3. B. B. McCormick & Sons, Jacksonville, Fla	709,463
4. Marion Contracting Co., Ocala, Fla	731,953
5. R. A. Bowen, Macon, Ga	745,188
6. L. J. & W. L. Cobb, Inc., Tampa, Fla	745,388
7. John E. Ballenger Constr. Co., Lakeland, Fla	769,853
8. Hall & Caddell, Jacksonville, Fla	793,988
9. James H. Craggs Constr. Co., Ocala, Fla	901,380

Alternate II—Coquina Rock Base Cource

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Base course aggregate	412,000 s. y.	$0.82	$1.09	....
2. Prime base course, RT-3	136,000 gal.	.15	.15	....

Alternate I—8-in. Limerock

Item	Quan.	(1)	(2)	(3)
1. Aggregate, base course	412,000 gal.	....	$1.44	$1.24
2. Prime base course, RT-3	136,000 gal.	....	.15	.125

Surface Course—1½-in. Hot Mix

Item	Quan.	(1)	(2)	(3)
1. Tack coat, asphalt cement	65,300 gal.	.12	.12	.105
2. Aggregate, surface course	30,600 ton	3.64	3.40	3.43
3. Asphalt cement	566,000 gal.	.0985	.10	.087
4. Seal asphalt, RC-2	81,600 gal.	.12	.115	.11
5. Aggregate, seal coat	2,900 ton	3.75	4.50	3.50
6. Driveway surfacing	1,400 s. y.	.50	1.25	1.00

STREET PAVING, ALBUQUERQUE, N. M.

OWNER: New Mexico State Highway Dept., Santa Fe.; F. M. Limbaugh, state highway engineer.

PROJECT: Grading, minor drainage structures, base course surfacing, bituminous topping, and miscellaneous construction along Gibson Avenue in the city of Albuquerque, Bernalillo County, New Mexico. Approximate length is 2.554 miles.

CONDITIONS: Contractor to furnish all materials and equipment, and complete project in 45 calendar days. Rail transportation facilities available to Albuquerque, and city streets to site of work. Wage rates are: skilled labor, 80c. to $1.50 per hour; semi-skilled, 60 to 80c.; and common, 45 to 55c.

BIDS: Six bids were received September 10, 1943, ranging from the contract low of $38,680 to $60,719.

LIST OF BIDDERS:

1. W. J. Culbertson, Albuquerque, N. M. (contract)	$38,680
2. Martin & Cowart, Albuquerque, N. M	41,558
3. Floyd Haake, Santa Fe, N. M	49,805
4. Brown Brothers, Albuquerque, N. M	51,3
5. A. O. Peabody, Santa Fe, N. M	56,31
6. Shufflebarger Trans. & Storage, Albuquerque, N. M	60,71

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, unclassified	9,344 c. y.	$0.25	$0.60	[illegible]
2. Excavation for structures	140 c. y.	1.00	.75	[illegible]
3. Excavation for pipe culverts	73 c. y.	1.00	1.00	[illegible]
4. Overhaul	5,500 sta. y.	.02	.02	[illegible]
5. Haul (quarter-mile yards)	83,500 ¼-mi. y.	.03	.035	[illegible]
6. Rolling, steel-tired roller	55 hr.	5.50	6.00	[illegible]
7. Rolling, sheepsfoot roller	213 hr.	3.75	5.00	[illegible]
8. Cement concrete pavement spillways	513 s. y.	2.60	4.00	[illegible]
9. Watering	670 M gal.	1.25	2.00	[illegible]
10. Class A conc., curb and gutter	14 c. y.	32.50	30.00	[illegible]
11. Class B concrete	28 c. y.	28.00	25.00	[illegible]
12. Pl. conc. pipe culv., 24-in. dia., 4½-in. shell	300 l. f.	4.24	4.00	[illegible]
13. Bracing	10 ea.	2.50	2.00	[illegible]
14. Galvanized woven wire farm fence	1,810 l. f.	.21	.30	[illegible]
15. Remove and rebuild fence	5,005 l. f.	.18	.05	[illegible]
16. New posts for rebuilding fence	145 ea.	.65	.50	[illegible]
17. Contour ditches	320 l. f.	.05	.10	[illegible]
18. Base course surf., No. 1 aggregate	10,820 ton	.84	.70	[illegible]
19. Pit run gravel ballast	18,050 ton	.53	.45	[illegible]
20. Mechanical tamping	70 hr.	3.85	6.00	[illegible]
21. Liquid asphaltic road oil (MC-3)	1,318 bbl.	4.46	4.50	[illegible]
22. Mixing oil and aggregate	2.508 mi.	275.00	550.00	[illegible]
23. Seal coating	2.508 mi.	300.00	400.00	[illegible]
24. Remove conc. curb and gutter	143 l. f.	.50	2.00	[illegible]

STREET PAVING, MILWAUKEE, WIS.

OWNER: City of Milwaukee, Wis.; J. P. Schwada, city engr.

PROJECT: Sheet asphalt paving (concrete base) North Richards St. from East Vienna Ave. to East Capitol Drive, and North Sixteenth St. from West Wisconsin Ave. to West Kilbourn Ave. in Milwaukee, Wis. Includes necessary cut and fill, curbing, gutters, drives and walks, and removal of some of existing pavement, walks, curbs, drives and gutters.

CONDITIONS: Contractor to furnish all materials and complete work in three months. City streets available for transportation of materials. Wage rates are: skilled labor, $1.40 to $1.75 per hour; semi-skilled, $1.25; and common, $1.05.

BIDS: Two bids were received August 9, 1943 on each project as shown in the "List of Bidders" below.

Paving North Richards Street

LIST OF BIDDERS:

1. William F. Hunt & Co., Milwaukee, Wis. (contract)	$33,056
2. White Consolidated, Inc., Milwaukee, Wis	33,332

Item	Quan.	Unit Prices (1)	(2)
1. Cut	421 c. y.	$0.70	[illegible]
2. Fill	237 c. y.	.70	[illegible]
3. 3-in. asphalt wearing surface	6,563.53 s. y.	1.58	[illegible]
4. 8-in. concrete base	6,191.93 s. y.	1.79	[illegible]
5. 8-in. concrete pavement	40.45 c. y.	1.90	[illegible]
6. 5-in. walk	13,951 s. f.	.195	[illegible]
7. Curb and gutter	2,454.88 l. f.	.97	[illegible]
8. Drives	2,687 s. f.	.29	[illegible]
9. Walk and drive removed	19,089 s. f.	.06	[illegible]
10. Pavement removed	5,561.55 s. y.	.65	[illegible]
11. Surface removed	304.90 s. y.	.25	[illegible]
12. Curb or curb-gutter removed	1,225 l. f.	.08	[illegible]
13. Steps removed	20 l. f.	.07	[illegible]
14. 3-in. concrete walks	606 s. f.	.15	[illegible]
15. H. E. S. concrete base	72 s. y.	1.95	[illegible]
16. Safety islands	37 s. f.	.45	[illegible]

Paving North Sixteenth Street

LIST OF BIDDERS:

1. White Consolidated, Inc., Milwaukee, Wis. (contract)	$25,80
2. William F. Hunt & Co., Milwaukee, Wis	26,71

Item	Quan.	Unit Prices (1)	(2)
1. Cut	425 c. y.	$0.60	[illegible]
2. Fill	30 c. y.	.60	[illegible]
3. 3-in. std. sheet asphalt surface	5,074 s. y.	1.57	[illegible]
4. 8-in. concrete base	4,408 s. y.	1.80	[illegible]
5. Curb-gutter	2,009 l. f.	.90	[illegible]
6. 5-in. walks	14,445 s. f.	.20	[illegible]
7. 8-in. drives	1,456 s. f.	.30	[illegible]
8. 3-in. walks	837 s. f.	.16	[illegible]
9. Walk and drive removed	19,860 s. f.	.065	[illegible]
10. Pavement removed	3,507 s. y.	.70	[illegible]
11. Curb or curb-gutter removed	2,199 l. f.	.10	[illegible]
12. Surface removed	520 s. y.	.25	[illegible]
13. Special gutter	23 l. f.	.70	[illegible]
14. Remove retaining wall	3 l. f.	.80	[illegible]
15. Extra binder	20 ton	9.50	[illegible]

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BUY MORE WAR BONDS

STREET IMPROVEMENTS CINCINNATI, OHIO

OWNER: City of Cincinnati, Ohio; Dept. of Public Works.

PROJECT: Improvement of Connecticut Avenue, from Oakwood Avenue to Witherby Avenue, by grading, installing necessary sewer of 15- to 24-in. concrete or vitrified pipe, installing other necessary drains and inlets, making necessary changes in and additions to the water distribution system, installing sewer and water house services within the street lines, laying four-foot cement walks, sodding, and constructing 24-ft. concrete roadway with integral concrete curbs.

CONDITIONS: Contractor to furnish all material, labor and equipment necessary to complete the project, except that the city will furnish sewer and waterworks castings, and the necessary cast iron pipe. Highway, railway and water transportation facilities available. Wage rates in the Cincinnati area are: skilled labor, $1.45 to $1.75 per hour; semi-skilled, 90c. to $1.45; and common labor, 85c.

BIDS: Two bids were received March 16, 1943, the contract low of $17,645, and $17,990. These prices were on the basis of the concrete pipe sewers. On the basis of vitrified pipe sewers the only bid received was $18,972 from David Crawley.

LIST OF BIDDERS:

1. W. L. Harper, Cincinnati, Ohio (concrete sewers)	$17,645
2. David Crawley, Cincinnati, Ohio (concrete sewers)	17,990
2a. David Crawley, Cincinnati, Ohio (vitr. pipe sewers)	18,972

Item	Quan.	UNIT PRICES (1)	(2)	(3)*
1. Grading, excavation	1,800 c. y.	$0.40	$0.30	$0.50
2. Removing trees	15 s. f.	4.00	3.00	5.00
3. Sodding	1,500 s. y.	.20	.25	.25
4. Concrete pavement, 8-in	2,850 s. y.	2.65	2.63	2.70
5. Integral concrete curb, rolling	2,125 l. f.	.25	.30	.30
6. Cement walk	7,200 s. f.	.20	.25	.22
7. Concrete driveways	2,500 s. f.	.25	.30	.27
8. Concrete masonry (1:6)	2 c. y.	18.00	20 00	18.00
9. Standard manholes	5 ea.	70.00	75.00	70.00
10. Manholes readjusted	5 ea.	10.00	5 00	10.00
11. Inlets, gutter, double	6 ea.	40.00	40 00	40.00
12. Hauling sewer castings	5 ton	4.00	3.00	5.00
13. Brick masonry	5 c. y.	25.00	20.00	27.00
14. House drains	500 l. f.	1.00	.80	1.00
15. Bends, 6-in	50 ea.	.75	1.00	1.00
16. Laying 6-in. cast iron pipe	20 l. f.	4.00	1 00	1.00
17. Hauling and setting 6-in. fire hydrants.	2 ea.	10.00	10 00	10.00
18. Lower existing 6-in. water mains	100 l. f.	.60	1.00	.60
19. Lower exist. ¾- to 2-in. serv. branches.	100 l. f.	.75	.80	.75
20. Reset exist. curb and rdway. boxes	10 ea.	1.00	1.00	1.00
21. Brick masonry for valve chambers	2 c. y.	30.00	20 00	27.00
22. Conc. masonry (1:6), valve chambers.	1 c. y.	12.00	10 00	10.00
23. Haul waterworks castings	5 ton	4.00	3 00	5.00
24. Clean and relay exist. 6-in. pipe	24 l. f.	1.25	1.00	1.00
25. Adjust exist. valve chambers	5 ea.	4.00	5.00	4 00
26. 15-in. concrete pipe, sewers	210 l. f.	2.00	2.00	2.00
27. 18-in. concrete pipe, sewers	20 l. f.	3.00	3.00	3.00
28. 21-in. concrete pipe, sewers	840 l. f.	4.00	4 00	4.00
29. 24-in. concrete pipe, sewers	60 l. f.	4.50	5.00	4.50
30. 12-in. conc. pipe inlet connections	130 l. f.	1.50	1.85	1.65
31. T-branches on 15-in. conc. pipe sewer.	7 ea.	1.50	2.00	2.20
32. T-branches on 21-in. conc. pipe sewer.	30 ea.	3.00	4 00	4.00
26a. 15-in. vitr. pipe, sewers	210 l. f.	No Bid	2 25	2.00
27a. 18-in. vitr. pipe, sewers	20 l. f.	No Bid	3.50	3.00
28a. 21-in. vitr. pipe, sewers	840 l. f.	No Bid	5.00	4.00
29a. 24-in. vitr. pipe, sewers	60 l. f.	No Bid	6 00	4.50
30a. 12-in. vitr. pipe inlet connections	130 l. f.	No Bid	2 00	1.65
31a. T-branches on 15-in. vitr. pipe sewer.	7 ea.	No Bid	2.00	2.20
32a. T-branches on 21-in. vitr. pipe sewer.	30 ea.	No Bid	4.00	4.00

* *Engineer's estimate.* *a Denotes alternate allowed for concrete pipe sewer construction.*

STREET REPAVING, CLEVELAND

OWNER: City of Cleveland, Ohio; J. C. Wenrick, city engineer.

PROJECT: Repaving over water line trench in St. Clair Ave. from London Rd. to Melville Rd. in Cleveland, Ohio. Requires 2,875 sq. yd. of concrete repaving and 7,900 sq.yd. of brick repaving, and necessary curbing, gutters, and setting catchbasin castings, vault frames and valve boxes to grade.

CONDITIONS: Contractor to furnish all materials. No stipulated contract time is specified. Highway transportation facilities available. Wage rates are: skilled labor, $1.50 to $1.7 per hour; semi-skilled, $1.25; and common, $1.00.

BIDS: Three bids were received August 19, 1943, ranging from the contract low of $79,780 to $83,968.

LIST OF BIDDERS:

1. Lombardo Brothers Constr. Co., Cleveland, Ohio (contract)	$79,78
2. Cuyahoga Asphalt and Paving Co., Cleveland, Ohio	81,06
3. Galier Brothers, Cleveland, Ohio	83,96

Item	Quan.	UNIT PRICES (1)	(2)	(3)
1. Excavation and fill	3,900 c. y.	$2.00	$2.40	$5.
2. 15½x8x10-in. concrete foundation	7,300 s. y.	4.00	4.20	3.
3. 8-in. concrete foundation	125 s. y.	4.00	3.50	3.
4. 7-in. concrete foundation	2,750 s. y.	3.00	3.20	2.
5. 4-in. brick pavement, grout filled (incl. gran. slag cushion)	7,900 s. y.	3.25	2.95	3.
6. 2-in. asphaltic concrete (T 7-B)	2,300 s. y.	1.00	1.45	1.
7. Reset existing sandstone curb	100 l. f.	1.00	.90	1.
8. Reset existing granite curb	750 l. f.	1.00	1.20	1.
9. Furn. and set 5x20-in. sandstone curb	50 l. f.	2.00	2 00	2.
10. Furn. and set 5x20-in. granite curb	100 l. f.	3.00	3 00	2.
11. Clean and relay stone block	85 s. y.	1.00	5.00	3.
12. New granite block pavement	100 s. y.	5.00	7.50	6.
13. Set catchbasin castings	25 ea.	10.00	15.00	20.
14. Set vault frame to grade	3 ea.	30.00	20.00	25.
15. Set valve boxes to grade	10 ea.	30.00	12.00	10.
16. Additional concrete, Class 2	8 c. y.	20.00	15.00	15.
17. Additional concrete, Class 6	10 c. y.	15.00	14.00	16.
18. Puddling	10,000 s. y.	.10	.03	.
19. Pressure grouting	7,900 s. y.	.30	.20	.
20. Additional asphaltic concrete (T 7-B)	10 ton	10.00	14.50	12.

RECONSTRUCT STREETS, PITTSBURGH

OWNER: Board of Commissioners, Allegheny County, Pa.

PROJECT: Concrete paving work in connection with the reconstruction of Water Street and Duquesne Way begins at point 175-ft. west of Barbeau Street and continues to the east side of Eleventh Street. Consists generally of paving Eastbound Roadway (present Duquesne Way) and portions of streets that intersect it; portions of the approaches to the Sixth, Seventh and Ninth Street bridges; connections from Eastbound Roadway to Westbound Roadway and River Boulevard; and all grading and other work incidental to completion of paving, including maintenance of traffic.

CONDITIONS: Contractor to furnish all materials except chain-link fence and 1-in. water meters, and complete work in 120 calendar days. Rail, highway and water transportation facilities available to site of work. Project has AA-3 priority rating. Wage rates in Pittsburgh area are: skilled labor, $1.50 to $1.90 per hour; semi-skilled, $1.00 to $1.25; and common, 80 to 90c.

LIST OF BIDDERS: (Bids received Feb. 9, 1943)

1. Dinardo, Inc., Pittsburgh, Pa. (contract)	$248,418
2. McCrady Construction Co., Pittsburgh, Pa	254,437
3. M. O'Herron Co., Pittsburgh, Pa	255,794
4. Nardulli & Sons Co., Pittsburgh, Pa	325,041

Item	Quan.	UNIT PRICES (1)	(2)	(3)
1. Excavation, Class I	2,000 c. y.	$1.50	$2.50	$1.
2. Remove, dispose of exist. pavmt. in all new roadway areas	16,500 s. y.	.50	1.00	.
3. Preparation of subgrade of roadway pavmts. laid on conn. roadways	1,700 s. y.	.25	.30	.
4. Concrete, Cl. A; light pole found'n	57 ea.	50.00	26.00	40.
5. Wood anchor bolt covers	108 ea.	12.00	4.50	20.
6. Concrete, Cl. A; traffic islands	35 c. y.	20.00	23.00	30.
7. Remove and dispose of undisclosed artificial underground structures	10 c. y.	15.00	10.00	5.
8. Embankment; granulated slag	16,000 c. y.	.80	1.10	1.
9. Concrete, Cl. A-s; encasing steel columns	3 c. y.	60.00	75.00	40.
10. Concrete, Cl. B; retaining wall	7 c. y.	60.00	40.00	35.
11. Conc., Cl. A-m; sidewalks on grade	55,000 s. f.	.35	.35	.
12. Conc., Cl. A; base course in street railway area (8-in.)	1,500 s. y.	3.25	3.75	4.
13. As above, 6-in. thick	1,500 s. y.	3.10	2.75	4.
14. Conc., Cl. P; 4-in. surf. crse. in str. railway area	3,000 s. y.	3.25	2.50	2.
15. Conc., Cl. P; spec. 1-crse. pavmt. (10-in.)	17,500 s. y.	4.00	4.10	3.
16. Conc., Cl. P; spec. 1-crse. private entrance pavmt., 8-in. thick	850 s. y.	4.00	4.00	4.
17. Conc., Cl. A-m; curb	5,500 l. f.	2.00	1.90	2.
18. Conc., Cl. A-m; curb with underdrain	4,300 l. f.	2.50	2.40	2.

(*Continued on page* 180)

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STREETS, PITTSBURGH (cont'd)

19. Conc., Cl. A-m; curb with underdrain, and 6-in. perf. clay pipe	800 l. f.	2.75	2.80	3.00
20. Reset precast concrete curb	500 l. f.	1.25	1.50	1.00
21. Reset precast conc. curb. with underdrain	320 l. f.	1.75	2.00	1.75
22. Cement (substitute HES for standard in conc. if ordered)	5,000 sacks	.25	.17	.20
23. 12-in. rein. conc. pipe culvert	420 l. f.	3.25	3.90	3.50
24. 12-in. clay pipe culv. (extra str.)	96 l. f.	3.25	3.70	3.50
25. 12x12-in. clay pipe wyes	10 ea.	8.00	20.00	6.00
26. Brick catch basins, Types 1 and 1-A	4 ea.	225.00	230.00	200.00
27. Brick catch basins, Type 1 (incl. all castings)	7 ea.	225.00	230.00	200.00
28. As above, Type 4	3 ea.	225.00	225.00	200.00
29. As above, Type 6	1 ea.	225.00	240.00	200.00
30. Brick storm inlets, Type 1 and 1-A	4 ea.	175.00	210.00	175.00
31. Brick storm inlet, Type 5	1 ea.	175.00	220.00	175.00
32. Brick storm inlet, Type 6	1 ea.	175.00	230.00	175.00
33. Brick storm inlet, Type 1 (incl. all castings)	10 ea.	175.00	210.00	175.00
34. As above, Type 4	1 ea.	175.00	220.00	175.00
35. Brick manholes	4 ea.	200.00	220.00	175.00
36. Extra depth of catch basins	35 l. f.	15.00	22.00	20.00
37. Extra depth of storm inlets	10 l. f.	15.00	18.00	20.00
38. Extra depth of manhole	30 l. f.	15.00	35.00	20.00
39. Raising catch basins, storm inlet or manhole castings	10 l. f.	15.00	18.00	20.00
40. Lowering catch basin, storm inlet or manhole castings	5 ea.	10.00	35.00	20.00
41. Brick masonry in doorway opening	10 c. y.	60.00	40.00	40.00
42. Underdrain	1,000 l. f.	1.00	.85	1.00
43. Concrete vault, Type B	35 ea.	50.00	150.00	100.00
44. Concrete vault, Type C	10 ea.	50.00	175.00	100.00
45. Wood handrail post with iron castings	18 ea.	70.00	75.00	20.00
46. Class B conc.; footers for fence	65 ea.	5.00	5.00	10.0
47. Remove, re-erect chain-link fence	600 l. f.	1.00	2.00	2.00
48. Complete demolition of 1-story bldg	Lump Sum	250.00	150.00	100.00
49. Deliver sound blockstone removed from exist. pavmt. to warehouse	150 M	20.00	35.00	25.00
50. Del. sound stone curb to warehouse	500 l. f.	.75	.60	1.00
51. Del. precast conc. curb to warehouse	800 l. f.	.75	.60	1.00
52. Contractor's tools, plant, equip't. and overhead	Lump Sum	22,000.00	8,000.00	8,000.00
53. Maintenance of pedestrian and vehicular traffic	Lump Sum	7,000.00	3,850.00	500.00
54. Provide entrance and exit for vehicles in Joseph Horne Bldg	Lump Sum	300.00	500.00	500.00
55. As above, parking garage in Fulton Bldg. basement	Lump Sum	100.00	250.00	200.00
56. As above, Fulton Bldg. freight entr	Lump Sum	100.00	250.00	200.00
57. As above, Spear Co. parking lot	Lump Sum	100.00	300.00	200.00
58. As above, Nernst Lamp Co. lot	Lump Sum	100.00	300.00	200.00
59. Vehicular entrances and exits to and from other buildings	2 ea.	100.00	250.00	100.00
60. Furn., relay 8-in. centr. B. & S. Cl. 250 cement lined c. i. pipe	780 l. f.	4.00	5.60	4.50
61. As above, 6-in	300 l. f.	3.50	5.30	4.00
62. Furn., install 8-in. hub gate valves	3 ea.	75.00	125.00	100.00
63. Furn., install 6-in. hub gate valves	12 ea.	55.00	100.00	85.00
64. Furn., install c. i. deep frames, covers	90 sets	30.00	30.00	30.00
65. Brick masonry (water lines)	130 c. y.	50.00	40.00	40.00
66. Concrete (water lines)	35 c. y.	25.00	35.00	20.00
67. Excavation (water lines)	30 c. y.	3.00	5.00	1.00
68. Fire hydrants	14 ea.	100.00	175.00	125.00
69. Raise 36-in. AWWA Cl. D, B & S cast iron pipe	675 l. f.	15.00	10.00	8.00
70. Furn., relay 12-in. centr. B & S Cl. 250 cement lined cast iron pipe	408 l. f.	5.00	8.50	6.00
71. Furn., install 12-in. hub gate valves	4 ea.	125.00	225.00	200.00
72. Reset 1-in. water meter	1 ea.	30.00	30.00	50.00
73. Furn., install cast iron medium extension gate box	1 ea.	30.00	25.00	30.00
74. Furn. and place misc. steel in conn. with work on water lines	2,200 lb.	.10	.15	.10
75. Furn. and relay 1-in. lead pipe	20 l. f.	4.00	2.50	3.00

STREET PAVING, BALTIMORE, MD.

OWNER: City of Baltimore, Md.; Wm. N. D. Fischer, acting highway engineer.

PROJECT: Sheet asphalt paving, on 8-in. cement concrete base, Ashburton Street from Rayner Avenue to Lafayette Avenue, Baltimore, Md. Length of project 678 feet; width, 40 feet.

CONDITIONS: Contractor to furnish all materials and complete work in 25 working days. Highway transportation facilities available to site of work. Wage rates are: skilled labor, $1.00 per hour; semi-skilled, 85c; and common, 75c.

BIDS: Four bids were received August 18, 1943, ranging from the low of $25,637 to $28,335.

LIST OF BIDDERS:

1. American Paving & Contracting Co., Baltimore, Md. (low bidder)	$25,637
2. Baltimore Asphalt, Block & Tile Co., Baltimore, Md.	25,959
3. National Paving & Contracting Co., Baltimore, Md	27,828
4. P. Flanigan & Sons, Inc., Baltimore, Md	28,335

Item	Quan.	Unit Prices (1)	(2)
1. Grading and sub-grade shaping	4,050 c.y.	$1.78	$1.80
2. Pl. cem. conc. curb (6-in. wide, 20-in. deep)	1,400 l.f.	1.04	1.06
3. Cem. conc. sidewalk (5-in. depth, incl. grad.)	50 s.y.	2.80	2.75
4. Cem. conc. paving (8-in. deep; std. cement)	60 s.y.	2.80	2.75
5. Cem. conc. base crse. (8-in. deep; std. cem.)	3,400 s.y.	2.74	2.75
6. Cem. conc. base crse. (8-in. deep; HES cem.)	50 s.y.	2.96	3.00
7. Cem. concrete base course (std. cement)	10 c.y.	12.36	13.00
8. Cem. conc. headers (6-in. wide, 11-in. deep)	50 l.f.	.80	.75
9. ½ x 8-in. expan. joint filler (fiber or equal)	50 l.f.	.32	.35
10. ½ x 5-in. bitum. expansion joint	200 l.f.	.23	.25
11. ½ x 8-in. bitum. expansion joint	1,450 l.f.	.31	.31
12. Sheet asphalt paving (1½-in. wearing surface; 1½-in. binder course)	3,250 s.y.	1.69	1.73
13. Binder, complete in place	5 ton	8.90	9.00
14. Vitr. brick (2½-in. deep) gutters, ½-in. sand cement bed, cement grout filler	190 s.y.	3.65	3.75
15. 6-in. underdrain pipe	100 l.f.	1.15	1.25
16. Topsoil	10 c.y.	5.40	6.00
17. Cold patch	10 c.y.	10.50	11.00
18. Stone dust or screenings (1-in. depth)	100 s.y.	.14	.16
19. 4-in. terra cotta drain pipe	10 l.f.	.60	.70

HIGHWAY, FLORIDA

OWNER: State Road Dept. of Florida, Tallahassee; J. Dowling, state highway engineer.

PROJECT: Bituminous surfacing 13.484 miles of State R 79 from a point approximately one mile east of Bartow Lake Wales, Polk County, Fla. Involves removal of exist structures; regular excavation; lateral ditch excavation; s soil excavation; removal of portion of existing pavement; o haul; mixing and compacting materials for roadway; si course Ocala rock base; structural timber and timber pili drainage structures; curbing and guttering; and sidewalk

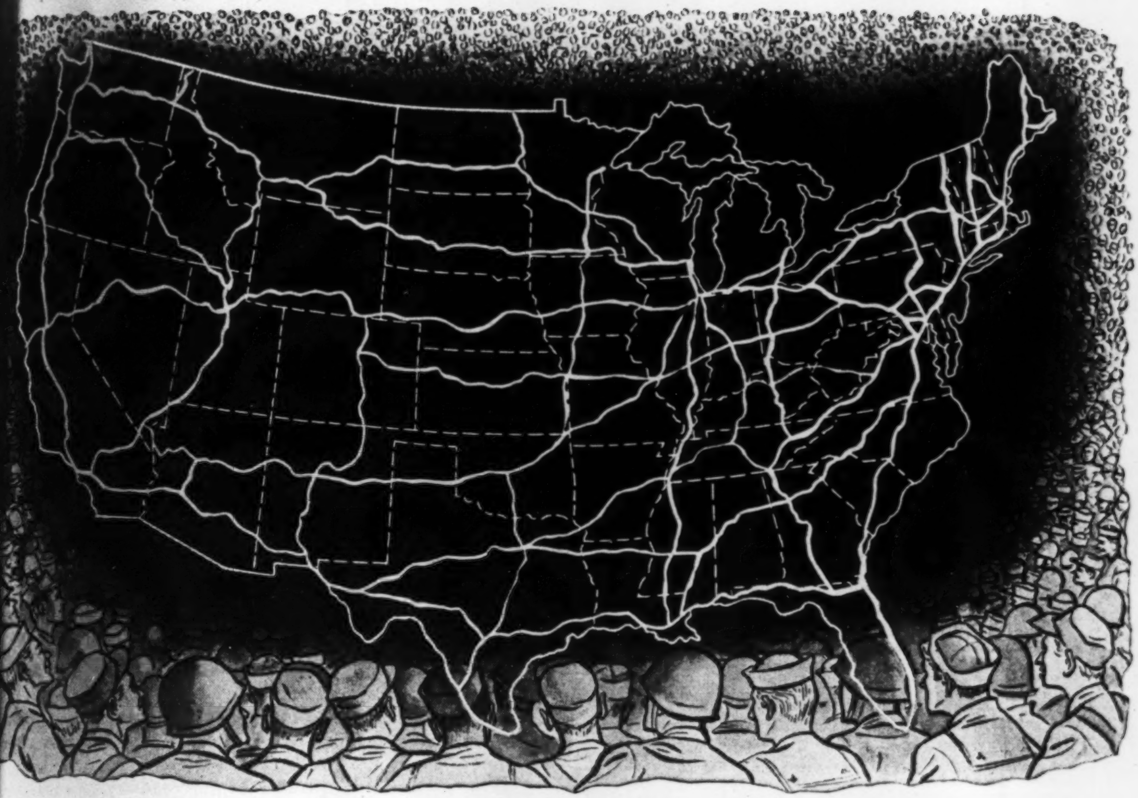
CONDITIONS: Owner is to furnish all materials and is furnish convicts for all common labor. Rail and highway tr portation facilities available to site of work. Time for c pletion: 310 working days.

BIDS: Five bids were received September 14, 1943, rang from the contract low of $289,406 to $327,322.

LIST OF BIDDERS:

1. Marion Contracting Co., Ocala, Fla. (contract)	$289
2. Hall & Caddell, Jacksonville, Fla	295
3. J. H. Craggs Constr. Co., Ocala, Fla	290
4. L. J. & W. L. Cobb, Inc., Tampa, Fla	303
5. R. H. Wright & Son, Columbus, Ga	327

Item	Quan.	Unit Prices (1)	(2)
1. Removal of existing structures (six)	Lump Sum	$2,930.00	$2,680.00
2. Regular excavation	196,461 c. y.	.32	.35
3. Lateral ditch excavation	22,688 c. y.	.36	.40
4. Subsoil excavation	115,594 c. y.	.60	.56
5. Remove existing pavement	56,760 s. y.	.10	.08
6. Overhaul (half-mile cubic yards)	39,172 ½-mi. c. y.	.05	.06
7 Mixing and compacting mat'ls., roadway (6-in. deep)	9,030 s. y.	.04	.06
8. Mixing and comp. mat'ls., rdway. (12-in.)	49,464 s. y.	.07	.08
9. Ocala rock base (single course, 6-in.)	181,326 s. y.	.38	.43
10. Tar prime material, RT-2	36,265 gal.	.07	.05
11. Cover material for Type 2	4,813 c. y.	1.90	1.50
12. Bituminous material (surf. trtmt.)	103,961 gal.	.05	.03
13. Retread aggregate with mineral seal	441 c. y.	1.90	1.50
14. Retread bituminous material	10,360 gal.	.06	.03
15. Untreated struct. timber (cypress)	252.45 Mbm.	75.00	78.00
16. Concrete, Class A (endwalls)	135.47 c. y.	27.00	25.00
17. Reinforcing steel	272 lb.	.10	.10
18. Untreated timber piling (cypress)	6,000 l. f.	.87	.85
19. Treated timber piling	10,900 l. f.	.87	.85
20. Timber sheet piling	6.64 Mbm.	75.00	78.00
21. Inlets, Type BSE, 4 to 6-ft. deep	5 ea.	125.00	135.00
22. Inlets, Type BRE, 4 to 6-ft. deep	3 ea.	125.00	135.00
23. Inlets, Type BMRE, 4 to 6-ft. deep	2 ea.	125.00	145.00
24. Inlets, Type BM2E, 4 to 6-ft. deep	7 ea.	125.00	145.00
25. Manholes, Type B, 4 to 6-ft. deep	2 ea.	125.00	100.00
26. Concrete curb (8-in. by 20-in.)	350 l. f.	.67	.70
27. Concrete curb and gutter	4,937 l. f.	.80	.75
28. Concrete sidewalk (4-in. thick)	11,743 s. f.	.13	.15
29. Concrete sidewalk (6-in. thick)	5,678 s. f.	.26	.25



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AS YOU BACK THE ATTACK GUARD AGAINST A FUTURE SLACK

HIGHWAY, VIRGINIA

OWNER: Dept. of Highways, Commonwealth of Virginia, Richmond.

PROJECT: Construction of 3.81 miles of plain concrete pavement in Princess Anne County, from a point 2.52 miles west of Lynnhaven Inlet to 2 miles east of eastern city line of Norfolk, Va. Pavement is 9-in. uniform. Project to include all necessary excavation, concrete structures, pipe, retaining walls, piling, curb and gutters, drainage structures, and seeding, sodding and topsoiling.

CONDITIONS: Contractor to furnish all materials and complete project in 180 calendar days. Rail, highway and water transportation facilities available. Prevailing wages to be paid.

BIDS: Eight bids were received November 4, 1943, ranging from the contract low of $232,014 to $326,947.

LIST OF BIDDERS:

1. W. H. Scott, Inc., Franklin, Va. (contract)	$232,014
2. Y. L. Brown, Richmond, Va	243,661
3. T. E. Ritter Co., Norfolk, Va	258,988
4. Norfolk Paving Co., Norfolk, Va	261,512
5. B. W. Jackson Contracting Co., Richmond, Va	271,772
6. Bero Engr. & Constr. Corp., Langley Field, Va	273,488
7. Highway Contractors, Inc., Norfolk, Va	286,216
8. Phil H. McGuire, Norfolk, Va	326.947

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	7 ac.	$300.00	$200.00	$300.00
2. Regular excavation	13,200 c. y.	.50	.56	.70
3. Borrow excavation	76,578 c. y.	.68	.68	.80
4. Class A concrete	27 c. y.	45.00	50.00	35.00
5. Class B concrete	36 c. y.	40.00	40.00	35.00
6. Metal reinforcement	2,031 lb.	.10	.07	.06
7. 15-in. pipe	1,284 l. f.	1.50	2.40	1.75
8. 18-in. pipe	411 l. f.	2.20	2.40	2.25
9. 24-in. pipe	9 l. f.	4.00	2.40	3.50
10. Pipe to be relaid	81 l. f.	2.50	2.40	1.50
11. Class C. concrete	8 c. y.	40.00	40.00	40.00
12. Conc. retaining walls (Cl. C)	152 c. y.	30.00	30.00	30.00
13. Grouted rubble gutter	14 s. y.	3.00	15.00	4.00
14. Piling untreated	2,640 l. f.	1.00	1.30	1.25
15. Wakefield piling (treated)	9 Mbm	300.00	400.00	275.00
16. Project markers	2 ea.	3.00	5.00	5.00
17. Reset project markers	6 ea.	2.50	4.00	2.50
18. Plain comb. cement conc. curb and gutter	6,741 l. f.	1.50	1.40	1.70
19. Radial comb. cem. curb and gutter	196 l. f.	1.50	1.75	2.50
20. HES cem. conc. (str. appr. & entr.)	554 s. y.	3.00	2.98	3.44
21. Curb. drop inlets complete	3 ea.	100.00	75.00	150.00
22. Spec. curb. drop inlets, complete	7 ea.	100.00	80.00	125.00
23. Curb catch basins	5 ea.	120.00	70.00	150.00
24. Spec. curb. catch basins	4 ea.	120.00	75.00	100.00
25. 4-in. concrete sidewalk	5,406 s. y.	1.80	2.00	1.60
26. 6-in. cement conc. median strip	33 s. y.	2.50	2.50	2.00
27. 4-in. cement conc. median strip	1,901 s. y.	1.80	1.70	1.60
28. Cement concrete lip curb	4,206 l. f.	1.10	.80	.60
29. Reset conc. rt.-of-way monuments	5 ea.	2.00	4.00	1.25
30. Remove steel fence	500 l. f.	.25	.12	.25
31. Cast iron grate with collar ((Std.)	1 ea.	30.00	30.00	50.00
32. Remove concrete pavement	2,699 s. y.	1.00	.75	.50
33. Selected local material	210 c. y.	5.00	4.60	3.00
34. Topsoil	4,850 c. y.	2.75	1.60	1.75
35. Seeding	76,090 s. y.	.08	.065	.08
36. Move and reset trees	29 ea.	10.00	10.00	4.00
37. Broadcast sodding	18,200 s. y.	.23	.11	.225
38. 9-in. plan cem. conc. pavement	14,052 s. y.	2.54	3.00	3.37
39. 9-in. plain cem. conc. pavement, monolithic lip curb	22,745 s. y.	2.54	3.12	3.04
40. 9-in. HES cem. conc. pavement	581 s. y.	3.00	3.18	3.34

HIGHWAY PAVING, TENNESSEE

OWNER: Tennessee Dept. of Highways and Public Works, Nashville, Tenn.

PROJECT: Concrete paving and improving 18.9 miles of highways between Shelbyville and Kirkland in Bedford, Rutherford and Williamson Counties, Tenn. Pavement is plain cement concrete, 7-in. uniform. Project includes roadway and drainage excavation along with minor quantities of culvert excavation, structure concrete, concrete curbing, and 18-in. pipe for culverts.

CONDITIONS: Contractor to furnish all materials and complete work in 130 working days. Rail and highway portation facilities available. Prevailing wage rates skilled labor, $1.25 to $1.50 per hour; semi-skilled, 75c. $1.00; and common labor, 35 to 50c.

BIDS: Seven bids were received May 28, 1943, ranging the contract low of $541,131 to $651,910. Awarded May 2

LIST OF BIDDERS:

1. M. T. Reed Constr. Co., Belzoni, Miss. (contract)	$541
2. Pittman Constr. Co., Atlanta, Ga	575
3. J. B. Michael Co. and H. E. Wolfe Constr. Co., Nashville, Tenn.	591
4. Foster & Creighton Co., Nashville, Tenn	603
5. Bowyer & Johnson, Jackson, Tenn	608
6. Stacey Bros. Co., Johnson City, Tenn	634
7. George O. White, Chattanooga, Tenn	651

Item	Quan.	Unit Prices (1)	(2)
1. Roadway and drainage excavation	43,912 c. y.	$0.42	$0.39
2. Culvert excavation, unclassified	3 c. y.	1.00	5.00
3. Plain cem. conc. pavmt. (7-in. uniform)	254,795 s. y.	2.05	2.19
4. Class B concrete	1.3 c. y.	32.00	50.00
5. Concrete curb	5.9 c. y.	48.00	40.00
6. 18-in. pipe culvert	10 l. f.	3.00	4.00

ROADWAY PAVING, TENNESSEE

OWNER: Tennessee Dept. of Highways, Nashville.

PROJECT: Concrete paving 12.724 miles of highway loca between Shelbyville and the Coffee County Line in Bedf and Moore Counties, Tenn. Includes all necessary roadway drainage excavation, 8-in. uniform plain concrete pavem timber guard posts, concrete grade crossing, and either crush stone or gravel for traffic bound roadway. Award made basis of gravel for the latter item.

CONDITIONS: Contractor to furnish all materials and co plete work in 60 working days. Rail and highway transpor tion facilities available. Wage rates are: skilled labor, 75c $1.25 per hour; semi-skilled, 45 to 75c.; common, 30 to

BIDS: Seven bids were opened September 24, 1943, rang from the contract low of $392,541 to $483,354.

LIST OF BIDDERS:

1. H. E. Wolfe Constr. Co., St. Augustine, Fla. (contract)	$392
2. Foster and Creighton Co., Nashville, Tenn	421
3. Weymouth Constr. Co., Memphis, Tenn	437
4. Pittman Constr. Co. & Stacy Bros. Co., Atlanta, Ga., and Johnson City, Tenn	437
5. Polk Smart Paving Co., Chattanooga, Tenn	453
6. T. M. Strider & Co., Nashville, Tenn	472
7. Bowyer & Johnson, Jackson, Tenn	483

Item	Quan.	Unit Prices (1)	(2)
1. Roadway and drainage excav. (uncl.)	31,866 c. y.	$0.30	$0.40
2. Plain cem. conc. pavmt. (8-in. uniform)	165,890 s. y.	2.21	2.39
3. Furn. and set timber guard posts	4,819 ea.	3.00	2.25
4. Concrete, grade crossing	178 s. y.	5.00	4.50
5. Traffic bound roadway alternate, crushed stone	370 c. y.	....	....
6. Traffic bound roadway alternate, gravel	370 c. y.	2.75	3.00

HIGHWAY, NORTH CAROLINA

OWNER: North Carolina State Highway and Public Wo Comn.; W. V. Baise, Raleigh, state highway engineer.

PROJECT: Grading and concrete paving 10.49 miles of U. Highway No. 70 between Croatan and the Carteret County Li in Craven County, N. C. Pavement is plain cement concr ranging in width from 4 to 22 ft.; and is 8-in. uniform.

CONDITIONS: Contractor to furnish all material except drainage pipe that has been salvaged by state, and hog-w and barbed wire fence which is to be reset. Rail, highway water transportation facilities available. Work to be compl

(Continued on page 185)

GHWAY, NORTH CAROLINA (cont'd)

150 days. Wage rates are: skilled labor, 55c. per hour; i-skilled, 35c; and common, 30c.

S: Four bids were received December 16, 1943, ranging the low of $229,416 to $260,626.

T OF BIDDERS:

F. D. Cline, Raleigh, N. C. (low bidder)	$229,416
J. S. Hill Constr. Co., Washington, N. C	239,377
Mecklenburg Constr. Co., Durham, N. C	260,233
Y. L. Brown, Richmond, Va	260,626

Item	Quan.	Unit Prices		
		(1)	(2)	(3)
earing	49 ac.	$100.00	$100.00	$175.00
rubbing	41 ac.	125.00	100.00	125.00
nclassified excavation	58,300 c. y.	.33	.40	.44
rainage ditches	6,500 c. y.	.60	.60	.75
orrow excavation	52,100 c. y.	.35	.40	.44
verhaul, ½-mile, special	10,000 c. y.	.06	.05	.06
ubgrade reinforcement	5,000 c. y.	1.00	.50	.75
onc. pavement, 8-in. uniform, 12 and 22-ft. wide	36,860 s. y.	2.50	2.60	2.65
onc. pavement, 8-in. uniform, width to 4 and 8-ft	27,480 s. y.	2.50	2.60	2.80
onc. pavmt., 8-in. uniform, 16-ft. wide.	710 s. y.	2.50	4.00	3.50
onc. pavement, 9-in. uniform, width under 4-ft	600 s. y.	3.00	3.00	4.25
lass C concrete, headwalls	25 c. y.	30.00	30.00	35.00
8-in. rein. concrete pipe	1,032 l. f.	2.00	2.25	3.00
4-in. rein. concrete pipe	140 l. f.	4.00	3.00	4.00
8-in. rein. conc. pipe exten	332 l. f.	2.50	2.50	3.00
4-in. rein. conc. pipe exten	220 l. f.	4.00	3.50	4.00
0-in. rein. conc. pipe exten	32 l. f.	6.50	6.00	6.00
elaid pipe, 18-in. and under	225 l. f.	1.25	1.00	2.50
elaid pipe, over 18-in	50 l. f.	2.00	1.50	4.00
houlder drains	200 c. y.	7.00	5.00	4.00
oncrete for inlet	1 c. y.	60.00	40.00	50.00
rating and frame for inlet	1 ea.	25.00	40.00	20.00
eset barbed wire fence	400 l. f.	.025	.02	.025
eset hog-wire fence	5,200 l. f.	.035	.03	.035
eset combination barbed and hog-wire fence	3,600 l. f.	.05	.05	.05
eset other fence	200 l. f.	.06	.05	.10
ight-of-way markers	150 ea.	3.00	2.50	3.00

HIGHWAY, NORTH CAROLINA

NER: North Carolina State Highway and Public Works mn., Raleigh.

OJECT: Grading and sand asphalt base and surface course 3.97 miles of U. S. Highway 17 at Hampstead, toward tle Hayne, in Pender County, N. C. Alternate bids for type base course with sand asphalt surface course were asked.

NDITIONS: Contractor to furnish all materials and com- te work in 110 calendar days. Rail and highway trans- tation facilities available. Minimum wage rates stipulated : skilled labor, 55c. per hour; semi-skilled, 35c.; and com- , 30c.

DS: Two bids were received September 2, 1943, the low of 6,031, and $148,200. No award has been made as yet, but Highway Commission has asked the concurrence of the lic Roads Administration for awarding the contract to the bidder.

T OF BIDDERS:

F. D. Cline, Raleigh, N. C. (low bidder)	$136,031
West Constr. Co. of North Carolina, Kinston, N. C.	148,200

Item	Quan.	Unit Prices	
		(1)	(2)
learing	21 ac	$150.00	$200.00
rubbing	14 ac.	200.00	200.00
nclassified excavation	23,500 c. y.	.60	.75
rainage ditches	600 c. y.	1.00	.75
orrow excavation	21,400 c. y.	.60	.75
verhaul on excavation (rdwy.) and borrow-free haul dist. 1,000-ft. at ½c. per c. y.	20,000 c. y.	.005	.005
ne-half mile overhaul (special)	28,000 c. y.	.06	.06
ubgrade reinforcement	4,000 c. y.	2.00	1.90
-in. sand asphalt base course	47,000 s. y.	1.10	1.15
-in. sand asphalt surf. course	47,000 s. y.	.55	.60
ass C concrete (headwalls)	16 c. y.	35.00	30.00
-in. rein. concrete pipe	232 l. f.	6.00	7.00
-in. plain concrete pipe	732 l. f.	3.00	2.75
-in. plain concrete pipe	96 l. f.	4.50	4.50
-in. plain conc. pipe extension	32 l. f.	3.00	3.00
elaid pipe, 18-in. or less	100 l. f.	1.00	1.50
elaid pipe, over 18-in. dia	50 l. f.	2.00	3.00
oulder drains	50 c. y.	7.00	8.00
19. Barbed wire fence reset	100 l. f.	.025	.025
20. Hog wire fence reset	1,000 l. f.	.035	.035
21. Comb. barbed and hog wire fence reset	100 l. f.	.05	.05
22. Right-of-way markers	32 ea.	3.00	3.50
23. Install RR advance warning and crossing signs	1 ea.	300.00	250.00
24. Unclassified structure excavation	400 c. y.	3.50	3.00
25. Remove existing structures	Lump Sum	500.00	575.00
26. Class A concrete	174 c. y.	38.00	40.00
27. Reinforcing steel	14,780 lb.	.07	.065

HIGHWAY, NORTH DAKOTA

OWNER: North Dakota State Highway Dept., Bismarck, N. D.; J. S. Lamb, commissioner.

PROJECT: Stabilized base and bituminous surfacing 21.971 miles of highway in Benson and Ramsey Counties, N. D., on U. S. Highway 2, Churches Ferry to Devils Lake.

CONDITIONS: Contractor to furnish all materials and complete work in 160 sixteen-hour working days. Rail and highway transportation facilities available to site of work. Wage rates are: skilled labor, 80c. per hour; semi-skilled, 60c.; and common labor, 45c.

BIDS: Eight bids were received September 3, 1943, ranging from the contract low of $333,842 to $492,782.

LIST OF BIDDERS:

1. Northern Improvement Co., Fargo, N. D. (contract)	$333,842
2. Northwest Engineering Co., Rapid City, S. D	349,369
3. M. B. Manson, Bismarck, N. D	368,460
4. Inland Construction Co., Omaha, Nebr	396,364
5. W. H. Noel Co., Jamestown, N. D	397,583
6. Peter Kiewit Sons Co., Omaha, Nebr	423,122
7. Megarry Brothers, St. Cloud, Minn	464,678
8. G. W. Haggart & Co., Fargo, N. D.	492,782

Item	Quan.	Unit Prices		
		(1)	(2)	(3)
1. Water for subgrade preparation	338 M gal.	$3.00	$2.00	$1.00
2. Stabilized base	172,711 ton	1.05	1.14	1.20
3. Prime bitumen (MC-1 for prime)	194,530 gal.	.10	.115	.11
4. Combined aggregate	35,369 ton	1.70	1.50	2.00
5. Mix bitumen (MC-3 or MC-5)	353,690 gal.	.10	.112	.10
6. Seal bitumen (MC-5)	166,478 gal.	.10	.115	.11
7. Seal aggregate (Grade 2)	3,406 ton	5.00	4.00	4.00
8. Biotter sand	1,427 ton	2.00	2.80	1.00

ROAD SURFACING, UTAH

OWNER: Utah State Road Comn., Salt Lake City.

PROJECT: Plant-mix bituminous road surfacing between Wendover and Knolls, in Tooele County, Utah. Length of project 16.4 miles; roadway width, 32-ft.; surfacing, 26-ft.

CONDITIONS: Contractor to furnish all materials and complete work in 240 working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.375 to $1.50 per hour; semi-skilled, $1.00 to $1.10; common, 75c.

BIDS: Ten bids were received Nov. 17, 1943, ranging from the contract low of $469,875 to $733,380. Estimate, $507,632.

LIST OF BIDDERS:

1. Jeff Hunt & F. M. Frandsen, Reno, Nev. (contract)	$469,875
2. Ryberg Co. and Strong & Grant, American Fork, Utah	478,922
3. Olof Nelson Constr. Co., Logan, Utah	483,733

Item	Quan.	Unit Prices		
		(1)	(2)	(3)
1. Plant-mix bituminous surfacing	46,000 gal.	$2.40	$2.50	$2.75
2. Bituminous mat'l., type RC-5	64,000 gal.	.11	.12	.105
3. Bitum. mat'l., 200-300 penetr.	530,000 gal.	.09	.10	.095
4. Bitum. mat'l., type MC-1	60,000 gal.	.11	.11	.105
5. Cr.gravel or cr. rock surf. crse	110,000 ton	1.45	1.30	1.35
6. Pitrun gravel	25,000 ton	1.25	1.20	1.30
7. Cover material	3,450 ton	3.25	4.00	3.00
8. Unclassified excavation	143,000 c. y.	.27	.25	.20
9. Overhaul, Class A	800,000 sta. y.	.015	.01	.01
10. Overhaul, Class B	550,000 y. mi.	.06	.09	.10
11. Watering	500 M gal.	1.50	2.00	1.00
12. Rolling	600 hr.	6.00	5.00	4.50
13. Excavation for structures	1,000 c. y.	1.50	4.00	1.00
14. Lumber (untreated)	53.7 Mbm.	125.00	160.00	125.00

HIGHWAY, NEW MEXICO

OWNER: New Mexico State Highway Dept., Santa Fe; B. G. Dwyre, state highway engineer.

PROJECT: Construction of 4.659 miles of roadway located in McKinley County, N. M., on U. S. Highway 66, between Gallup and Fort Wingate, consisting of base course surfacing and double bituminous surface treatment. Also involves removal of old drainage structures, and the obliteration of old road.

CONDITIONS: Contractor to furnish all material and complete work in 75 weather working days. Rail and highway transportation facilities available. Minimum wage rates specified are: skilled labor, 90c. per hour; semi-skilled, 60c.; and common labor, 40c.

BIDS: Four bids were received April 28, 1943, ranging from the contract low of $103,515 to $138,268. Engineer's estimate, $108,232.

LIST OF BIDDERS:

1. R. C. Carrico, Albuquerque, N. M. (contract)	$103,515
2. Brown Brothers, Albuquerque, N. M	125,388
3. E. M. Silver, Albuquerque, N. M	133,486
4. Skousen Brothers, Albuquerque, N. M	138,268

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old drainage structures	Lump Sum	$400.00	$1,000.00	$800.00
2. Rolling—steel-tired roller	93 hr.	4.50	6.00	6.00
3. Rolling—sheeps foot roller	307 hr.	5.00	6.00	5.00
4. Base course surf., No. 1 aggregate	18,500 ton	1.55	1.60	1.90
5. Watering	1,106 M gal.	2.50	4.00	4.50
6. Obliterating old road	4.659 mi.	100.00	100.00	100.00
7. Ballast	32,812 ton	1.05	1.35	1.60
8. Liquid asph. road oil, MC-3	1,172 bbl.	5.60	6.00	5.70
9. Cover material	2,232 ton	5.00	6.00	4.00
10. Asphalt	1,120 bbl.	5.60	6.00	5.80
11. Preparation of base course	4.659 mi.	300.00	1,000.00	700.00

HIGHWAY IMPROVEMENTS, NEW MEXICO

OWNER: New Mexico State Highway Dept., F. M. Limbaugh, State Highway Engineer.

PROJECT: Grading, minor drainage structures, three multiple-span concrete box culverts each over 20-ft. clear span, base surfacing, and other miscellaneous construction on U. S. Highway No. 84 and 85 between Santa Fe and Las Vegas, in San Miguel and Santa Fe Counties, N. Mex. Approximate length is 8.679 miles.

CONDITIONS: Contractor to furnish all materials and complete project in 200 weather working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 80c. to $1.50 per hour; semi-skilled, 60 to 80c.; and common, 45 to 55c.

BIDS: Seven bids were received July 6, 1943, ranging from the contract low of $380,630 to $538,378. Engineer's estimate, $492,567.

LIST OF BIDDERS:

1. D. D. Skousen & Co., Albuquerque, N. Mex. (contract)	$380,630
2. A. O. Peabody, Santa Fe, N. Mex	398,353
3. Martin & Cowart, Albuquerque, N. Mex	434,078
4. C. A. Switzer & Co., Denver, Colo	449,261
5. Henry Thygesen Co., Albuquerque, N. Mex	474,604
6. Lowdermilk & Bros., Denver, Colo	479,282
7. Brown Bros., Albuquerque, N. Mex	538,378

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old drainage structures	Lump Sum	$500.00	$500.00	$500.00
2. Remove obstructions	Lump Sum	300.00	100.00	25.00
3. Excavation, unclassified	302,000 c. y.	.265	.40	.34
4. Excavation for structures	8,100 c. y.	1.50	.75	2.00
5. Excavation for pipe culverts	2,660 c. y.	1.50	1.00	2.00
6. Overhaul	628,000 sta. y.	.02	.005	.01
7. Haul	42,000 ½-mi. y.	.10	.10	.10
8. Rolling, sheepsfoot roller	4,025 hr.	3.00	4.60	4.00
9. Base course surf., No. 1 aggregate	37,654 ton	1.04	.85	
10. Watering	3,014 M gal.	2.00	2.25	
11. Untreated timber check dams	352 l. f.	3.00	3.00	
12. Class A concrete culverts	2,971 c. y.	22.00	18.45	
13. Reinforcing steel	351,180 lb.	.054	.055	
14. Plain conc. pipe culvert, 24-in. diam., 4½-in. shell	2,624 l. f.	4.75	4.00	
15. As above, 30-in. diam., 5½-in. shell	2,856 l. f.	5.80	5.00	
16. Concrete monument and marker (unrein.)	2 ea.	30.00	25.00	
17. Bracing	80 ea.	4.00	2.00	
18. Right-of-way and station markers	95 ea.	5.00	4.00	
19. Remove and rebuild fence	11,700 l. f.	.06	.10	
20. Obliterating old road	0.13 mi.	500.00	100.00	
21. New posts for rebuilding fence	400 ea.	.50	1.00	
22. Contour ditches	27,250 l. f.	.08	.03	
23. Ballast	128,709 ton	.68	.75	
24. Mechanical tamping	1,248 hour	2.00	2.50	
25. Reflectorised warning posts	134 ea.	6.00	5.00	
26. Warning posts	67 ea.	6.00	4.50	

HIGHWAY IMPROVEMENTS, NEVADA

OWNER: Nevada Department of Highways, Carson City.

PROJECT: Improving a portion of the state highway syst in Elko County, Nev. (Route 1, Section B), from six mil east of Elko to one-half mile east of the North Fork Bridge Length of project is 9.815 miles. Includes paving with bit minous materials, grading, and drainage structures.

CONDITIONS: Contractor to furnish all materials. Rai and highway transportation facilities available. Prevailin wages to be paid on project.

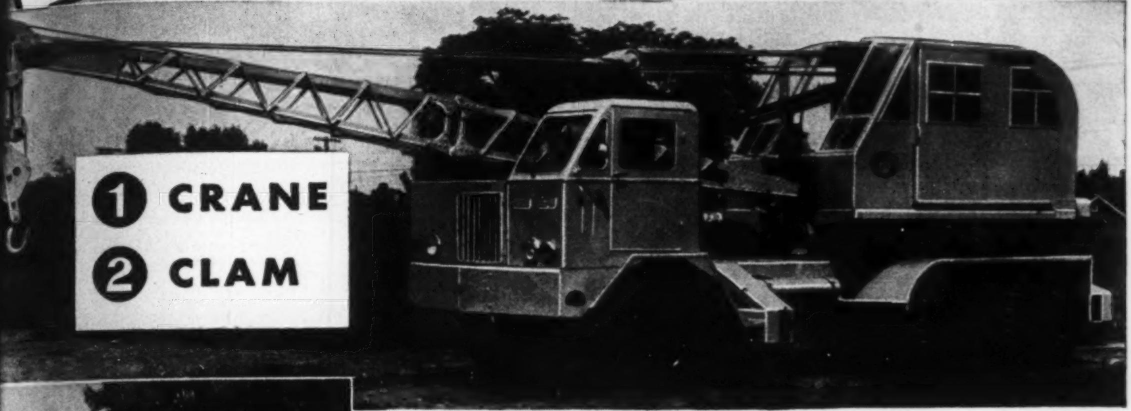
BIDS: Nine bids were received December 23, 1943, rangin from the contract low of $308,335 to $446,989.

LIST OF BIDDERS:

1. Carl E. Nelson Co., Logan, Utah (contract)	$308,33
2. Gibbons & Reed Co., Salt Lake City, Utah	332,5
3. Isbell Constr. Co., Reno, Nev.	356,05

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 95-hp. tractor with bulldozer or angledozer	40 hr.	$6.00	$7.00	
2. 95-hp. tractor with carryall	65 hr.	6.00	8.00	
3. Motor grader	152 hr.	4.00	5.00	
4. 1½-ton dump truck	100 hr	3.00	3.00	
5. ½-ton pickup	165 hr.	2.00	2.00	
6. Special detours (force account)	Force Acc't.	4,000.00	4,000.00	
7. Selected detour surfacing	21,475 ton	.28	.22	
8. Haul, sel'd detour surfacing	25,285 ton mi.	.06	.07	
9. Liquid asphalt, MC-2, prime detours	205 ton	22.00	22.00	
10. Signs	Lump Sum	500.00	400.00	
11. Remove fence	41,114 l. f.	.03	.05	
12. Remove concrete	92 c. y.	5.00	8.00	
13. Remove culvert pipe	1,410 l. f.	1.00	1.00	
14. Remove headwalls	62 ea.	5.00	20.00	
15. Remove cattle guard	Lump sum	100.00	300.00	
16. Move signs (force account)	Force Acc't.	150.00	150.00	
17. Remove, relay existing surface	800 s. y.	.30	.50	
18. Roadway excavation	303,907 c. y.	.14	.16	
19. Drainage excavation	2,921 c. y.	.30	.25	
20. "V" type ditches	163 sta.	3.00	3.50	
21. Borrow	43,890 c. y.	.18	.24	
22. Slope rounding	275 sta.	5.00	3.00	
23. Overhaul (yard stations)	1,261,548 y. sta.	.008	.01	
24. Overhaul (yard mile)	57,206 y. mi.	.10	.10	
25. Tamping roller	2,003 hr.	5.00	5.00	
26. Power roller	668 hr.	5.00	4.00	
27. Structure excavation	2,361 c. y.	1.00	1.25	
28. Backfill	1,985 c. y.	.50	1.00	
29. Subgrade, type B	9.82 mi.	200.00	200.00	
30. Roadside clean-up	Force Acc't.	500.00	500.00	
31. Water	10,525 M gal.	1.25	1.10	
32. Type 1, gravel base	117,288 ton	.35	.33	
33. Type 2, gravel base, 1-in.	46,798 ton	.42	.55	
34. Liquid asphalt, MC-1 (prime)	379 ton	22.00	23.00	
35. Liq. asph. type MC-2 (seal shldrs.)	53 ton	22.00	22.00	
36. Asph. cement, 200-300 pen seal plantmix	119 ton	21.00	23.50	
37. Screenings	904 ton	2.50	3.00	
38. Liq. asph., type MC-2 or MC-3 (roadmix shoulders)	819 ton	22.00	22.00	
39. Roadmix shoulders	19.53 mi.	300.00	225.00	
40. Asph. cem. (200-300 pen. plantmix)	969 ton	20.00	21.00	
41. Class F-2 plantmix bitum. surface	17,614 ton	1.60	1.85	
42. Class A concrete	514 c. y.	30.00	28.00	
43. Class B concrete	67 c. y.	30.00	35.00	
44. Reinforcing steel	52,780 lb.	.07	.09	
45. 30-in. rein. conc. pipe	358 l. f.	6.00	8.00	
46. 36-in. rein. conc. pipe	435 l. f.	8.00	11.00	
47. Relay culvert pipe	1,021 l. f.	1.00	1.00	
48. Grouted hand-laid riprap	29 c. y.	20.00	15.00	
49. Move pipe culvert headwalls	15 ea.	20.00	15.00	
50. Culvert markers	86 ea.	4.00	5.00	
51. Guide posts	38 ea.	4.00	5.00	
52. Reconstruct fence	40,267 l. f.	.08	.08	
53. Monuments	72 ea.	5.00	5.00	
54. 24-in. plain concrete pipe	1,140 l. f.	3.50	5.00	
55. Paved turnout ditches	950 l. f.	.50	.25	
56. Timber cattle guard	1 ea.	500.00	650.00	
57. Remove and reconstruct cattle guard	Lump Sum	500.00	500.00	
58. Move gates	9 ea.	10.00	12.00	

MICHIGAN *can do* 5 JOBS *for* YOU



① CRANE
② CLAM

③ SHOVEL

From Clamshell or Crane use, the 3/8 yard and 1/2 yard MICHIGANS can be quickly converted to shovel use by changing booms. Much time is saved because in the MICHIGAN, no changes are necessary in the operating mechanism. Full circle loading.

④ DRAGLINE

On the regular crane boom, the Michigan Dragline equipment can be rigged in an hour or less. An unusually long reach is possible with this attachment, and the high speed, AIR-CONTROLLED operation of all MICHIGANS means added work capacity.

⑤ TRENCH HOE

This attachment, with its eleven-foot digging depth, finds scores of uses in public works and private construction.

Trench Hoe is available for both 3/8 yard and 1/2 yard models, as are all attachments pictured here.

AIR CONTROLLED

WRITE FOR
1/2 YARD BULLETIN E244T
AND 3/8 YARD BULLETIN E244K

MICHIGAN
POWER SHOVEL CO.

BENTON HARBOR, MICHIGAN

HIGHWAY, WYOMING

OWNER: Wyoming Highway Dept., Cheyenne.

PROJECT: Grading, drainage, base course surfacing, oil treatment by road-mix method, stone chip seal coat, and construction of one treated timber bridge with eight 23-ft. spans on Rock Springs Airport Road, Rock Springs, Wyo. Total length of project is 3.683 miles.

CONDITIONS: Contractor to furnish all material except treated timber and 875 lb. of hardware. The above is to be obtained from existing but abandoned bridges. Contractor to dismantle bridges and haul necessary material to bridge site. Average haul is 85 miles. Rail and highway transportation facilities available to site of work. Completion time: 120 working days commencing 20 days after notice of award. Minimum rates are: skilled labor, 85c. to $1.20 per hour; semi-skilled, 70c.; and common, 65c.

LIST OF BIDDERS: (Bids received March 11, 1943.)

1. Wyoming Constr. Co., Laramie, Wyo. (contract)	$99,418
2. H. W. Read, Cheyenne, Wyo	100,758
3. Northwestern Engineering Co., Rapid City, S. D	109,544
4. C. C. Warrington, Cheyenne, Wyo	115,232
5. Leach Brothers, Cheyenne, Wyo	117,317
6. Inland Constr. Co., Omaha, Nebr	117,937

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	162,000 c. y.	$0.18	$0.19	$0.23
2. Overhaul	20,000 c. y. sta.	.015	.015	.015
3. Cubic yard mile haul	19,500 c. y. mi.	.20	.15	.18
4. Watering (embankment)	1,660 M. gal.	2.50	3.00	2.35
5. Sheepsfoot roller operation	960 hr.	3.50	3.00	3.00
6. Pneumatic-tired roller operation	30 hr.	5.00	3.50	5.00
7. Excavation for pipe culverts	50 c. y.	1.50	1.50	.75
8. 18-in. vitrified clay pipe	558 l. f.	2.50	2.60	2.50
9. Mechanical tamping	80 hr.	3.00	2.60	4.50
10. Class I riprap	120 c. y.	6.00	4.00	4.50
11. Grouted riprap	40 c. y.	10.00	8.00	10.00
12. Timber project markers	2 ea.	20.00	10.00	15.00
13. Pit run gravel base crse. (3-in. max.)	17,800 ton	.825	.90	.88
14. Crushed gravel base crse. (1-in. max.)	3,950 ton	1.13	1.19	1.30
15. Crushed gravel surfacing (¾-in. max.)	4,600 ton	1.13	1.19	1.30
16. Stone chips	445 ton	4.00	2.85	4.50
17. Base treatment, MC-1	150 ton	22.05	24.30	26.00
18. Seal coat, RC-3	77 ton	22.05	25.40	27.00
19. MC liquid asphalt distributed (MC-3)	300 ton	22.05	25.00	23.00
20. Processing roadway	45,400 s y.	.06	.045	.07
21. Watering (base)	350 M gal.	2.50	3.00	2.50
22. Roller operation (base)	220 hr.	5.00	2.70	4.50
23. Shaping and tamping curb	2,800 l. f.	.10	.05	.08
24. Shaping and tamping spillway	80 l. f.	.30	2.05	.20
25. Structure excavation	100 c. y.	2.00	1.00	1.30
26. New treated timber	26.041 M bm.	174.00	185.00	183.00
27. Salvaged treated timber	29.148 M bm.	53.30	50.00	45.00
28. Treated timber piling	1,666 l. f.	1.66	1.75	1.85
29. Untreated timber	1.650 M bm	150.00	165.00	150.00
30. Remove four timber bridges	Lump Sum	3,000.00	1,900.00	2,000.00
31. Patrol hours	50 hr.	9.00	5.30	6.00

HIGHWAY IMPROVEMENT, OREGON

OWNER: Oregon State Highway Dept., Salem, Ore.; Paul Van Scoy, division engr.

PROJECT: Grade widening, surfacing and oiling Jordan Creek-Scotts Butte Creek section of Idaho-Oregon-Nevada Highway in Malheur County, Ore. Includes 12.82 miles of grade widening; 34.56 miles of surfacing and oiling; and furnishing 9,400 cu.yd. of crushed material in stockpiles.

CONDITIONS: Contractor to furnish all materials and complete work by September 30, 1944. Highway transportation facilities are available to site of project. Minimum wages are: skilled labor, $1.20 per hour; semi-skilled, 75 to 90c; and common, 62½c.

BIDS: Six bids were received December 23, 1943, ranging from the contract low of $385,937 to $533,468.

LIST OF BIDDERS:

1. Rogers Constr. Co., Dayton, Wash. (contract)	$385,937
2. E. C. Hall Co. and J. C. Compton, Eugene and McMinnville, Ore.	405,469
3. McNutt Bros., Eugene, Ore	438,240
4. E. P. Bishop, Orland, Calif	
5. Morrison-Knudsen Co., Inc., Boise, Idaho	
6. Babler Bros., Portland, Ore	

Item	Quan.	Unit Prices (1)	(2)
1. Clearing and grubbing	Lump Sum	$2,000.00	$4,000.00
2. Trench excavation, unclassified	100 c. y.	2.00	2.00
3. General excavation, unclassified	40,000 c. y.	.50	.50
4. Truck haul	7,000 y. mi.	.20	.20
5. Finishing road bed and slopes	18 mi.	400.00	300.00
6. 18-in. sewer pipe	320 l. f.	2.75	3.00
7. 24-in. sewer pipe	20 l. f.	4.00	5.00
8. 36-in. sewer pipe	10 l. f.	8.00	10.00
9. Selected roadbed topping	120,000 c. y.	.40	.45
10. Hauling roadbed topping	260,000 y. mi.	.12	.14
11. Stripping topping mat'l. pits	30,000 c. y.	.25	.20
12. 1½-in. to 0-in. crushed gravel in base	38,500 c. y.	1.60	2.00
13. ¾-in. crushed material in shoulders	2,300 c. y.	1.90	2.25
14. Sprinkling	4,000 M gal.	2.00	2.00
15. Preparation of base	34.56 mi.	200.00	150.00
16. Furnish and place aggregates	22,700 c. y.	3.95	3.50
17. Furn. and place 151-200 pen. asph.	1,510 ton	37.00	40.00
18. RC-3 or emulsified asphalt	430 ton	38.00	40.00
19. ¾-in.-⅜-in. cr. mat'l (stockpile)	4,200 c. y.	2.60	2.50
20. As above, ⅜ to ½-in.	2,800 c. y.	2.60	2.50
21. Cr. mat'l. in stockpile, under ½-in.	2,400 c. y.	2.60	2.50
22. Clear and grub stockpile sites	Lump Sum	100.00	500.00
23. Leveling stockpile sites	Lump Sum	100.00	500.00

HIGHWAYS, IDAHO

OWNER: Idaho Dept. of Public Works, Boise.

PROJECT: Constructing a plant mix bituminous surface 11.203 miles of the Old Oregon Trail from Glenns Fe westerly, and from King Hill to the Gooding County line; on 6.086 miles of the Franklin Highway from Boise to Jo Corner; and seal coat on 3.628 miles of the Old Oregon Tr from Bliss westerly, in Ada, Elmore and Gooding Counti Idaho.

CONDITIONS: Contractor to furnish all materials and co plete work by Oct. 15, 1943. Rail and highway transportati facilities available. Wage rates are: skilled labor, $1.10 hour; semi-skilled, 90c.; and common, 75c.

BIDS: Three bids were received July 23, 1943, ranging fr the contract low of $133,404 to $162,450. Engineer's estim $153,614.

LIST OF BIDDERS:

1. Triangle Constr. Co., Boise, Idaho (contract)	$133,
2. S. Birch & Son, Great Falls, Mont	149,
3. Hoops Constr. Co., Twin Falls, Idaho	162,

Item	Quan.	Unit Prices (1)	(2)
1. Haul, on binder	3,000 mi. y.	$0.10	$0.21
2. Crushed gravel surfacing for shoulders	20,300 ton	.50	.68
3. Rolling, power roller	34 days	24.00	29.50
4. Watering, base and surf. course	310 M gal.	3.00	2.30
5. Binder	1,290 c. y.	.20	.54
6. Liquid asphalt prime coat, MC-1	2,125 bbl.	4.50	6.50
7. 200-300 penet. asph. for plant mix	1,615 ton	23.50	32.40
8. Plant mix bituminous surfacing	32,300 ton	1.80	1.45
9. Liquid asphalt seal coat, MC-5	2,135 bbl.	4.50	6.52
10. Cover coat material type B	4,550 ton	1.25	1.35

SURFACE AREA AND ACCESS ROAD, CALIFORNIA

OWNER: California State Division of Highways, Sacrament G. T. McCoy, state highway engineer.

PROJECT: Constructing surface area and access road n Honey Lake, Calif. Consists of graded area 500-ft. wide 9,000-ft. long; placing imported borrow from 6 to 31-in. dep placing plant mix surfacing over area 150-ft. wide by 6,70 long; and paving 150-ft. long with plain cement concrete each end of surfaced area.

CONDITIONS: Contractor to furnish all materials and co plete project by November 15, 1943. Rail transportation fa

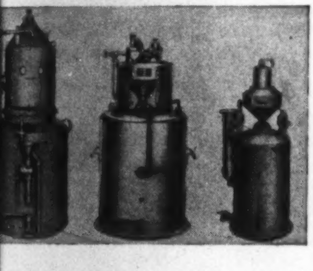
(Continued on page 192)

Hand Apparatus

Oxy-acetylene apparatus which may be ordered from Linde includes oxy-acetylene blowpipes for all welding and heating work; oxy-acetylene cutting blowpipes, cutting attachments, and nozzles; oxy-acetylene descaling and flame-priming equipment. Ox-
d apparatus is supplied from Linde offices and warehouses.
Purox and Prest-O-Weld lines are distributed by industrial
automotive jobbers. Prest-O-Lite air-acetylene appliances for
lering and brazing are also distributed by these jobbers.

Welding Rods, Fluxes, and Supplies

Oxweld welding rods and fluxes are of exceptionally high quality. The many kinds and sizes of Oxweld rods make it possible to select the one that will give best results on each job.
Oxweld line also includes gloves, goggles, lighters, hose,
ules, and asbestos paper. Rods, fluxes, and supplies may be
ered from Linde or from automotive and industrial jobbers.



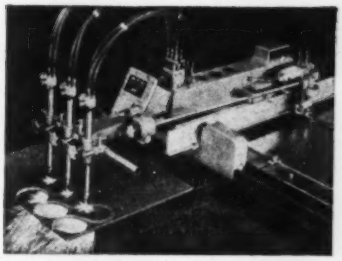
Generators and Manifolds

Oxweld acetylene generators produce low-cost acetylene and are made for both portable and stationary use—with maximum generating capacities of
n 30 to 9,000 cu. ft. per hour. Oxweld oxygen and acetylene
ifolds are used for centralizing the oxygen and acetylene
ply from cylinders.

LINDE
Oxy-Acetylene
PROCESSES

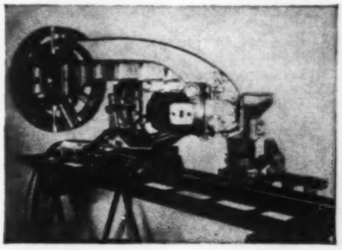
Send for This Catalog—

For a more detailed description of Linde processes, and for more information about availability of Linde products, process literature, and process service, send for the descriptive, 8-page catalog shown here.



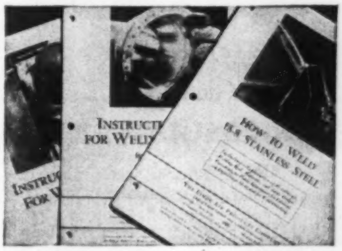
Machine Apparatus

Included in the complete line of Oxweld apparatus are portable and stationary oxy-acetylene shape-cutting machines; straight-line cutting machines; flame-hardening apparatus; bar and billet cut-off machines; equipment for automatic welding; and tractor units for plate-edge preparation.



Unionmelt Welding

This unique electric process makes high-quality welds in any commercially used thickness of steel — in one pass—and without flash, glare, or sparks —at speeds as much as twenty times greater than similarly applicable methods. The process is fully automatic. Speed and current values are established by electric controls adjusted by an operator.



Process Literature

Linde makes available to customers an extensive library of process literature which contributes to the knowledge of operators and shows how to use the oxy-acetylene process profitably.

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ACETYLENE
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UNION CARBIDE

Oxygen, Acetylene, Carbide

Linde oxygen, Prest-O-Lite acetylene, and Union Carbide are distributed through numerous Linde plants and warehouses located to assure dependable deliveries and low transportation costs. This reflects Linde's efforts to help assure availability of these materials.

words "Stellite," "Linde," "Prest-O-Lite," "Union," "Oxweld," "Purox," "Prest-O-Weld," and "Unionmelt" are trade-marks.

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

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In Canada: Dominion Oxygen Company, Limited, Toronto

FOR VICTORY
BUY
UNITED STATES
WAR
BONDS AND STAMPS

ACCESS ROAD, CALIF. (cont'd)

ties available. Wage rates are: skilled labor, $1.25 to $1.75 per hour; semi-skilled, 90c. to $1.20; and common, 85c.

BIDS: Six bids were received August 27, 1943, ranging from the contract low of $521,901 to $914,870.

LIST OF BIDDERS:

1. Radich & Brown, San Leandro, Calif. (contract)	$521,901
2. E. B. Bishop, Orland, Calif	582,125
3. A. Teichert & Co., Sacramento, Calif	592,333
4. Parish Bros. and A. S. Vinnell Co., Sacramento, Calif	611,202
5. R. A. Westbrook, Sacramento, Calif	767,786
6. Bressi & Bevanda Constructors, Inc., Los Angeles, Calif.	914,870

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	153 ac.	$23.55	$50.00	$30.00
2. Roadway excavation	84,000 c. y.	.238	.33	.25
3. Ditch and channel excavation	10,000 c. y.	1.02	.25	.25
4. Structure excavation	40 c. y.	3.27	1.50	2.00
5. Overhaul	400,000 sta. y.	.02	.005	.006
6. Compacting original ground (Type A)	116,700 s. y.	.08	.06	.05
7. Compacting original ground (Type B)	410,600 s. y.	.03	.02	.02
8. Imported borrow	445,000 ton	.43	.60	.58
9. Preparing subgrade (conc. pavmt.)	.5,000 s. y.	.16	.10	.10
10. Develop water supply and furnishing watering equipment	Lump Sum	19,618.00	5,550.00	10,000.00
11. Applying water	31,000 M gal.	2.59	1.75	1.20
12. Finishing construction area	Lump Sum	4,420.00	2,500.00	11,000.00
13. Crusher run base	38,500 ton	1.39	1.75	2.60
14. Liquid asphalt, MC-5 (seal coat)	132 ton	29.84	25.00	25.00
15. Screenings (seal coat)	1,000 ton	3.40	3.00	4.00
16. Liquid asphalt, MC-2 (prime coat)	132 ton	29.84	25.00	25.00
17. Mineral aggregate (plant-mix surf.)	24,000 ton	2.07	3.00	3.00
18. Paving asphalt (plant-mix surf.)	1,300 ton	25.17	22.00	22.00
19. Liquid asph., MC-3 (PMS stock piles)	10 ton	5.88	30.00	32.00
20. Cl. B plain cement conc. (pavement)	1,060 c. y.	13.47	18.00	18.00
21. 24-in. un-rein. concrete pipe	48 l. f.	6.50	5.75	4.50

BRIDGE AND HIGHWAY, ARKANSAS

OWNER: Arkansas State Highway Dept., Little Rock; W. W. Mitchell, state highway engineer.

PROJECT: Construction of reinforced-concrete deck girder bridge, grading, drainage structures and concrete paving 0.295 miles of State Highway 64, Section 1, in Sebastian County, Ark. (Fort Smith-Van Buren Road.)

CONDITIONS: Contractor to furnish all materials and complete work in 200 working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.25 per hour; semi-skilled, 75c; and common, 60c.

BIDS: Four bids were received October 1, 1943, ranging from the contract low of $338,741 to $396,195.

LIST OF BIDDERS:

1. Pioneer Constr. Co., Malvern, Ark. (contract)	$338,741
2. J. P. McNulty, Pine Bluff, Ark	339,897
3. S. E. Evans Constr. Co., Ft. Smith, Ark	368,396
4. Ottinger Bros., Oklahoma City, Okla	396,195

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	12.2 ac.	$200.00	$200.00	$200.00
2. Grubbing	12.2 ac.	200.00	200.00	200.00
3. Common excavation	4,093 c. y.	.50	.85	.50
4. Dry excavation, structures	635 c. y.	5.00	3.00	2.00
5. Wet excavation, structures	451 c. y.	5.00	3.00	5.00
6. Embankment material	21,339 c. y.	.60	.85	.52
7. Remove old culverts	3 ea.	200.00	150.00	200.00
8. Special compaction, earth	25,432 c. y.	.05	.10	.08
9. Gravel shoulders	548 c. y.	4.00	3.00	3.50
10. Portland cem. conc. pavmt. (9-in.)	5,160 s. y.	4.00	3.50	3.50
11. Reinforcing steel, pavements	4,050 lb.	.10	.06	.10
12. Class S concrete, bridges	3,306 c. y.	26.00	25.00	30.00
13. Reinforcing steel	742,500 lb.	.05	.06	.07
14. Concrete piling	10,352 l. f.	4.00	4.00	4.00
15. Concrete railing	3,087 l. f.	3.00	3.00	5.00
16. Metal bearing and roadway expansion devices	79,500 lb.	.15	.17	.15
17. Class A concrete	0.7 c. y.	50.00	25.00	50.00
18. Class B concrete	3.32 c. y.	50.00	25.00	50.00
19. 30-in. non-rein. conc. pipe culv	68 l. f.	5.00	4.00	5.00
20. Timber guard fence	1,560 l. f.	2.00	2.00	1.75
21. Solid sodding	5,000 s. y.	.40	.40	.40
22. Remove and dispose of conc. pavmt	2,832 s. y.	.40	.60	.40
23. Remove and stockpile exist. bit. surf. crse. and base course	610 s. y.	.40	.60	
24. Riprap	13,850 ton	6.00	6.00	
25. Grading	2,660 c. y.	1.00	1.00	
26. Remove exist. bldg. struct. and maintain traffic	Lump Sum	10,000.00	2,500.00	

HIGHWAY AND BRIDGE IMPROVEMENT NEW MEXICO

OWNER: New Mexico State Highway Dept., Santa Fe.

PROJECT: Grading, minor drainage structures, repairing a strengthening existing timber bridges, surfacing, and oil pr essing 9.001 miles of State Route No. 30 between Espanola a Otowi in Santa Fe and Rio Arriba Counties, New Mexico.

CONDITIONS: Contractor to furnish all materials and co plete work in 45 weather working days. Rail and highway tra portation facilities available. Wage rates are: skilled labor, 8 to $1.50 per hour; semi-skilled, 60 to 80c.; and common, 45c. BIDS: Four bids were received November 13, 1943, rangi from the contract low of $87,731 to $107,524.

LIST OF BIDDERS:

1. Martin & Cowart, Albuquerque, N. M. (contract)	$87,7
2. A. O. Peabody, Santa Fe, N. M	88,1
3. Lowdermilk Bros., Denver, Colo	91,
4. Skousen Bros., Albuquerque, N. M	107,5

Items	Quan.	Unit Prices (1)	(2)
1. Remove old drainage structures	Lump Sum	$1,000.00	$600.00
2. Unclassified excavation	21,000 c. y.	.50	.40
3. Rolling (steel-tired roller)	179 hr.	6.00	5.00
4. Rolling (sheepsfoot roller)	388 hr.	4.00	6.00
5. Watering (thousand gallons)	354 M gal.	3.00	2.50
6. Class A concrete	439 c. y.	35.00	40.00
7. 24-in. plain conc. pipe culv., 4½-in. shell	620 l. f.	6.00	6.00
8. 30-in. pl. conc. pipe culv., 5¼-in. shell	48 l. f.	8.00	7.50
9. 36-in. pl. conc. pipe culv., 5¾-in. shell	140 l. f.	10.00	9.00
10. Contour ditches	1,900 l. f.	.20	.10
11. Construct and maintain detour road	1.1 mi.	1,000.00	1,600.00
12. Pit run grav. base crse. surf	2,191 c. y.	.80	1.40
13. Pit run grav. top crse. surf	2,158 c. y.	.80	1.40
14. Cutback asphalt (MC-3)	4,551 bbl.	5.50	5.00
15. Mixing oil and aggregate	8.959 mi.	1,000.00	1,400.00
16. Grading	6.830 mi.	1,000.00	600.00
17. Cl. A conc. substructure (bridge)	56 c. y.	45.00	40.00
18. Untreated timber substructure	5.116 Mbm.	200.00	160.00
19. Treated timber piling	784 l. f.	3.00	3.00

HIGHWAY AND BRIDGE, VIRGINIA

OWNER: Virginia Department of Highways, Richmond.

PROJECT: Construction of 2.457 miles of waterbound ma adam mixed in place cold bituminous surface treatment, fro intersection of State Route 211 (near Buckland) to poi 2.457 miles south of intersection, on State Routes 295 and 6 in Fauquier County, Va. Also bridge over South Run fro Sta. 87+26 to Sta. 87+74. Bridge is reinforced concret span on 30-deg. skew; length 48-ft.; roadway 26-ft. cle

CONDITIONS: Contractor to furnish all materials and co plete work in 120 calendar days. Highway transportati facilities available. Prevailing wages to be paid.

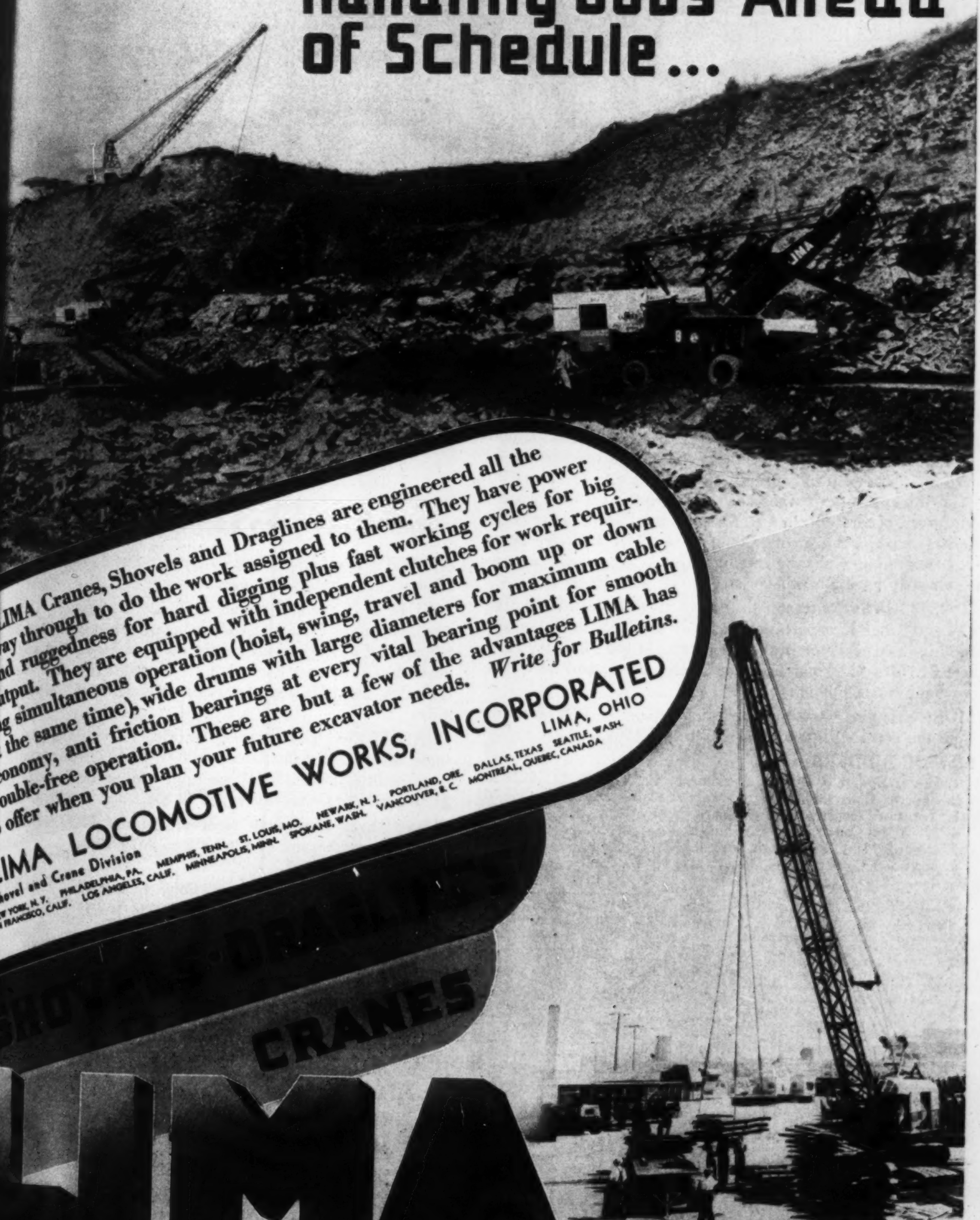
BIDS: Seven bids were received December 21, 1943, ran ing from the contract low of $75,009 to $98,958.

LIST OF BIDDERS:

1. Blackwell Engr. & Constr. Co., Warrenton, Va. (contract)	$75,
2. Corson & Gruman, Washington, D. C.	79,
3. Echols Bros., Inc., Staunton, Va.	79,
4. Kent & Co., Richmond, Va.	81,
5. M. S. Hudgins, Roanoke, Va.	89,
6. Pendleton Constr. Corp., Wytheville, Va.	97,
7. W. W. Sanders, Warrenton, Va.	98,

(*Continued on page* 194)

LIMAS keep Material Handling Jobs Ahead of Schedule...



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SHOVELS 3/4 YD. TO 5 YDS. DRAGLINES - VARIABLE CRANES 13 TONS TO 100 TONS

HIGHWAY AND BRIDGE, VA. (cont'd)

Roadway

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grubbing	1 ac.	$300.00	$250.00	$300.00
2. Regular excavation	27,302 c. y.	.42	.55	.43
3. Concrete, Class C	13 c. y.	32.00	30.00	22.00
4. 6-in. pipe underdrains	300 l. f.	1.15	.50	1.00
5. Subgrade underdrains, CD-1 or CD-2	770 l. f.	.50	.70	.70
6. 15-in. concrete pipe	450 l. f.	1.75	2.00	2.25
7. 18-in. pipe	144 l. f.	2.00	2.25	3.00
8. 12-in. pipe	18 l. f.	1.70	1.75	1.50
9. Project markers, Federal-Aid	2 ea.	5.00	10.00	5.00
10. State project marker	1 ea.	5.00	5.00	5.00
11. No. 13 stone for subgrade treatment	1,498 ton	1.75	2.60	2.50
12. No. 13 stone for entrances	4 ton	3.00	3.00	2.50
13. Plain concrete curb	358 l. f.	1.25	1.00	1.25
14. Scarifying and reshaping	11,173 s. y.	.07	.15	.12
15. Waterbound macadam, 22-ft. by 8-in.	12,836 s. y.	1.40	1.25	1.65
16. Widening, 8-in. waterbound macad.	7,517 s. y.	1.60	1.35	1.95
17. Bituminous material (RC-2)	42,278 gal.	.12	.14	.14
18. Covering material	1,586 ton	4.75	5.00	3.75
19. Bonding material, No. 13 stone	272 ton	2.50	2.60	2.50

Bridge

Items	Quan.	Unit Prices (1)	(2)	(3)
10 Class A concrete, superstr.	77.9 c. y.	$32.00	$35.00	$26.00
21. Reinforcing steel, superstr.	21,700 lb.	.06	.06	.06
22. Class B conc., substructure	332.2 c. y.	26.00	32.00	20.00
23. Cl. A excavation, substructure	173 c. y.	3.00	2.00	2.00
24. Cl. B. excavation, substructure	146 c. y.	6.00	3.00	6.00

PAVING AND BRIDGE, PENNSYLVANIA

OWNER: Board of Commissioners, Allegheny County, Pittsburgh, Pa.; Levi Burd Duff, engineer.

PROJECT: Paving McKnight Road (Section 4), bituminous penetration base course with 2-in. asphalt wearing surface for portion of project; and special one-course concrete (Class P), 12-in. thick, for the balance of the project. Also constructing reinforced concrete bridge at Babcock Boulevard Interchange, Ross Township, Allegheny County, Pa. Work includes necessary excavation, embankments, curbing, gutters, traffic islands, center strip paving, drainage structures, waterlines, etc.

CONDITIONS: Contractor to furnish all materials. Rail, highway and water transportation facilities available to Pittsburgh, and highway to site of work. Wage rates in the Pittsburgh area are: $1.75 to $1.90 per hour for skilled labor, and 80 to 90c. per hour for common.

BIDS: Six bids were received September 7, 1943, ranging from the contract low of $338,237 to $439,909.

LIST OF BIDDERS:

1. Frank Donatelli & Sons, Pittsburgh, Pa. (contract)	$338,237
2. Sanctis Constr. Inc., Pittsburgh, Pa	355,881
3. Yorktown Constr. Co., New York, N. Y	366,331
4. McCrady Constr. Co., Pittsburgh, Pa	403,044
5. Dinardo, Inc., Pittsburgh, Pa	423,753
6. Melwood Constr. Corp., New York, N. Y	439,909

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Class I excavation	64,000 c. y.	$0.50	$0.55	$1.00
2. Remove, dispose of underground brick	20 c. y.	3.00	5.00	10.00
3. Refilling, granulated slag	5,000 c. y.	1.25	2.00	1.80
4. Embankment, granulated slag	4,000 c. y.	.50	1.50	1.00
5. Concrete, Class A-M	5,000 s. f.	.23	.35	.35
6. Conc., Cl. P, special 1-crse. pavmt., 12-in. thick	13,000 s. y.	3.75	3.75	3.70
7. Conc., Cl. P-M, pavmt. in center strip, incl. all steel reinforcing	1,000 s. y.	3.75	4.00	2.80
8. Concrete, Cl. A-M curb	4,500 l. f.	1.45	1.75	1.50
9. Cl. A-M conc. curb with underdrain and 6-in. perf. clay pipe	500 l. f.	2.00	2.75	2.00
10. Spec. conc. curb, Class A-S	300 l. f.	3.00	4.25	1.50
11. Spec. conc. guard curb, Class A-S	3,000 l. f.	2.50	1.25	1.50
12. Class B conc. endwalls and footers	18 c. y.	31.00	50.00	20.00
13. Cl. P conc. berm gutter, type 2	800 s. y.	3.25	3.50	3.00
14. Class A-M conc. traffic islands	3 c. y.	31.00	25.00	75.00
15. Bitum. penetration base crse (8-in.), with 2-in. asph. wearing surf.	1,000 s. y.	3.00	3.75	3.40
16. Cold mix asph. surf. crse., fine aggr.	25 ton	11.00	14.00	12.00
17. Wood post barrier	400 post	7.00	6.50	5.00
18. 12-in. rein. conc pipe culvert	300 l. f.	3.00	2.50	2.00
19. 15-in. rein. conc. pipe culvert	340 l. f.	3.50	3.00	2.20
20. 12-in. clay pipe culvert	300 l. f.	2.85	2.00	1.50
21. 15-in. clay pipe culv. or sewer	800 l. f.	2.75	2.50	2.00
22. 18-in. clay pipe culvert	900 l. f.	3.25	3.50	2.50
23. 15-in. clay culv. curves, 45-deg.	4 ea.	5.00	7.50	10.00
24. 18-in. by 15-in. clay wyes	3 ea.	13.00	18.00	10.00
25. 18-in. by 12-in. clay wyes	5 ea.	8.00	10.00	10.00
26. 15-in. by 15-in. clay wyes	2 ea.	9.00	15.00	10.00
27. 15-in. by 12-in. clay wyes	3 ea.	7.00	10.00	10.00
28. Brick catchbasins, type 6 or 6-A	2 ea.	180.00	160.00	40.00
29. Spec. brick catchbasins, type 6 or 6-A	2 ea.	170.00	145.00	
30. Brick storm inlets, type 5	3 ea.	135.00	145.00	
31. Special brick storm inlets, type 5	3 ea.	125.00	125.00	
32. Brick storm inlets, type 6 or 6-A	8 ea.	150.00	150.00	
33. Spec. brick storm inlets, 6 or 6-A	8 ea.	140.00	120.00	
34. Brick manholes	2 ea.	120.00	150.00	
35. Special brick manholes	2 ea.	110.00	120.00	
36. Trapped brick manholes	1 ea.	200.00	160.00	
37. Special trapped brick manholes	1 ea.	195.00	150.00	
38. Extra depth catch basins	10 l. f.	25.00	20.00	
39. Extra depth manholes	10 l. f.	40.00	20.00	
40. Malleable iron gratings	4 ea.	24.00	25.00	
41. Wood gratings for endwalls	3 ea.	25.00	15.00	
42. Underdrain with 6-in. perf. clay pipe	3,000 l. f.	1.25	1.00	
43. Cl. B conc. encasement for 15-in. clay pipe	120 l. f.	3.25	2.25	
44. Topsoil, in place	2,000 s. y.	.65	.60	
45. Grass seeding, in place	2,000 s. y.	.15	.30	
46. Contractors' tools, plant, equip., etc.	Lump Sum	25,625.00	20,000.00	
47. Maintain Evergreen Rd. traffic	Lump Sum	700.00	1,000.00	
48. 8-in. centr. b. & s. Class 250, cement lined cast-iron pipe	48 l. f.	4.50	3.00	
49. As above, 6-in.	24 l. f.	4.25	2.50	
50. 8-in. Class D cast iron pipe	150 l. f.	3.00	2.00	
51. 6-in. Class D cast iron pipe	465 l. f.	2.75	2.00	
52. 1-in. brass ferrule, drain connection	1 ea.	3.00	12.00	
53. 8-in. hub gate valves	1 ea.	95.00	75.00	
54. Resetting fire hydrant	1 ea.	25.00	50.00	
55. Cast iron frames and covers	3 ea.	30.00	30.00	
56. Brick work on water lines	7 c. y.	60.00	40.00	
57. Conc. and appurtenant work (water lines)	7 c. y.	60.00	18.00	
58. Additional excavation	10 c. y.	3.00	2.50	
59. Miscellaneous steel	200 lb.	.15	.15	
60. Excavation, Class 2 (bridge)	3,300 c. y.	1.50	1.50	
61. Concrete (Cl. A and A-a) for bridge superstructure below rdwy. slab	460 c. y.	31.00	45.00	
62. Cl. B conc. for footers, abutments and wing walls	4,200 c. y.	19.00	18.00	
63. Conc. Cl. A-M for sidewalk on struct., incl. fascio and intermed. beams	1,490 s. f.	3.25	3.00	
64. Conc. Cl. A-S, for guard on curb	190 l. f.	3.00	1.00	
65. Medium carbon steel	3,500 lb.	.10	.20	
66. Malleable iron castings	48,000 lb.	.46	.55	
67. Steel reinforcing bars	550,000 lb.	.05	.06	
68. Wood railing	460 l. f.	2.25	3.00	
69. Malleable iron posts for railing	50 ea.	.58	.65	
70. Rail, malleable iron incl. posts	460 l. f.	14.50	16.00	
71. Bridge floor, conc., Cl. A-M	430 s. y.	12.00	15.00	

HIGHWAY AND BRIDGE, NEW MEXICO

OWNER: New Mexico State Highway Dept., Santa Fe; F. M Limbaugh, state highway engineer.

PROJECT: Grading, minor drainage structures, one 16-f double-span concrete and steel bridge, ballast, base course su facing, and miscellaneous construction on State Highway No. between Otowi and Los Alamos, in Santa Fe and Sandov Counties, New Mexico. Approximate length of project is 6 miles.

CONDITIONS: Contractor to furnish all materials and com plete work in 90 calendar days. Rail and highway transporta tion facilities available. Wage rates are: skilled labor, 90c. $1.50 per hour; semi-skilled, 60 to 80c.; and common, 45c.

BIDS: Three bids were received August 14, 1943, rangin from the contract low of $367,732 to $479,848.

LIST OF BIDDERS:

1. Lowdermilk Bros., Denver, Colo. (contract)	$367,73
2. Henry Thygesen & Co., Albuquerque, N. Mex	383,90
3. Allison & Armstrong, Roswell, N. Mex	479,84

Road Items

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove old drainage structures	Lump Sum	$950.00	$400.00	
2. Removal of obstructions	Lump Sum	425.00	1,000.00	
3. Excavation, unclassified	260,000 c. y.	.80	.83	
4. Excavation, for structures	848 c. y.	2.00	2.00	
5. Excavation, for pipe culverts	2,454 c. y.	2.00	3.00	
6. Overhaul	426,000 sta. y.	.02	.035	
7. Haul (quarter-mile yards)	59,000 ¼-mi. y.	.08	.09	
8. Rolling, steel-tired roller	124 hr.	6.00	6.00	
9. Rolling, sheepsfoot roller	2,912 hr.	5.00	5.50	
10. Hand laid rock embankment	4,200 c. y.	1.50	2.00	
11. Watering	3,576 M gal.	3.00	3.50	
12. Class B concrete	5 c. y.	35.00	30.00	
13. Class A concrete	283 c. y.	35.00	24.00	
14. Reinforcing steel	14,604 lb.	.08	.09	
15. Mortar rubble masonry	138 c. y.	30 00	22.00	
16. Std. rein. conc. pipe culvert, 18-in.	520 l. f.	4.00	4.00	
17. Std. rein. conc. pipe culvert, 24-in.	1,618 l. f.	5.00	5.00	
18. Std. rein. conc. pipe culvert, 30-in.	1,254 l. f.	6.00	5.50	
19. Std. rein conc. pipe culvert, 36-in.	516 l. f.	7.50	7.00	
20. Std. rein. conc. pipe culvert, 48-in.	296 l. f.	12.00	14.00	
21. Dry rubble retaining wall	460 c. y.	12.00	4.00	
22. Obliterating old road	1.203 mi.	150.00	200.00	

(*Continued on page* 198)

BUCYRUS ERIE
15-B
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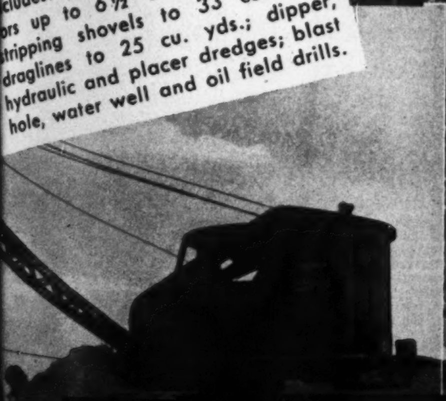

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HIGHWAY AND BRIDGE, N. MEX. (cont'd)

Item	Quan.	(1)	(2)	(3)
23. Base crse. surfacing (No. 1 aggregate)	16,520 ton	1.00	.90	1.30
24. Ballast	25,030 ton	.90	.60	.90
25. Mechanical tamping	635 hr.	4.00	6.00	2.75
26. Remove and rebuild cattle guards	Lump Sum	500.00	400.00	800.00
27. Boulder car stops	940 ea.	2.50	4.00	7.50
28. Contour ditches	1,000 l. f.	.10	.80	.10
29. Install salvaged corr. met. pipe, 24-in.	50 l. f.	2.00	3.50	3.00

Bridge Items

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, for structures	490 c. y.	$2.50	$2.50	$5.00
2. Class A conc.; superstructure	59.45 c. y.	40.00	26.00	31.50
3. Class B conc.; substructure	391.22 c. y.	30.00	22.00	24.50

HIGHWAY BRIDGE, NEW MEXICO

OWNER: New Mexico State Highway Dept., F. M. Limbaugh, engineer.

PROJECT: Construction of concrete and timber bridge across Pecos River in Eddy County, N. Mex., between Loving and Potash Mines. Structure made up of fifteen 50-ft. spans. Alternate bids were asked on treated and untreated timber in bridge; contract awarded on basis of treated timber construction.

CONDITIONS: Contractor to furnish all materials and complete job in 125 weather working days. Rail and highway transportation facilities available. Wage rates are: skilled labor, 80c. to $1.50 per hour; semi-skilled, 60 to 80c.; and common labor, 45 to 55c.

BIDS: Two bids were received July 6, 1943, the contract low of $145,331, and $167,750 for the treated timber alternate; and the low of $131,956, and $162,735 for the untreated timber alternate. Engineers estimate $124,807.

LIST OF BIDDERS: (Treated timber, basis of award)

Bidder	Amount
1. J. H. Ryan, Albuquerque, N. Mex. (contract)	$145,331
2. Frank M. Kenney, Denver, Colo	167,750

Item	Quan.	Unit Prices (1)	(2)	(3)*
1. Excavation, unclassified	125 c. y.	$1.00	$0.50	$0.50
2. Excavation for structures	2,070 c. y.	8.00	10.00	5.00
3. Class B concrete	1,735.57 c. y.	30.00	33.00	24.00
4. Reinforcing steel	4,466 lb.	.10	.08	.09
5. Mechanical tamping	150 hr.	6.00	5.00	3.00
6a. Untreated timber superstructure	334.365 M bm.	185.00	250.00	215.00
6b. Treated timber superstructure	334.365 M bm.	225.00	265.00	215.00

** Engineer's estimate. Items 6a and 6b are alternate bids for timber superstructure.*

OVERPASS AND APPROACHES WYOMING

OWNER: Wyoming Highway Dept., Cheyenne.

PROJECT: Construction of overhead crossing over Union Pacific Railroad tracks near Baxter, Wyo., including dismantling, removal and re-erection of portions of existing Ozone Viaduct; and grading, draining, base course surfacing, oil treatment by road-mix method, and other incidental work on bridge approaches on 0.442 miles of Rock Springs Airport Road in Sweetwater County.

CONDITIONS: Contractor to furnish all materials except 45 tons of steel and 15.5 M ft., bm. of treated timber, which are salvaged materials and to be obtained from existing but now abandoned structures. Contractor to dismantle these structures and haul necessary materials to new bridge site. Haul on steel is 250 miles; and on timber is 85 miles. Rail and highway transportation facilities available, and project is to be completed in 150 working days commencing 20 days after notice of award. Minimum wages are: skilled labor, 85c. to $1.20 per hour; semi-skilled, 70c.; and common, 65c.

BIDS: Five bids were opened April 13, 1943, ranging from the contract low of $79,932 to $121,098.

LIST OF BIDDERS:

Bidder	Amount
1. Woodward Construction Co., Rock Springs, Wyo. (contract)	$79,93
2. E. E. Peterson, Casper, Wyo	91,37
3. H. W. Read, Cheyenne, Wyo	92,58
4. Northwestern Engr. Co., Rapid City, S. D	97,75
5. Blanchard Brothers, Cheyenne, Wyo	121,09

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	158,000 c. y.	$0.14	$0.165	$0.2
2. Cubic yard mile haul	57,000 c. y. mi.	.145	.20	.15
3. Watering (embankment)	1,800 M gal.	1.25	2.50	3.0
4. Sheepsfoot roller operation	1,050 hr.	3.75	3.50	3.0
5. Pneumatic-tired roller operation	50 hr.	4.50	6.00	4.0
6. Excavation for pipe culverts	110 c. y.	1.50	2.00	1.3
7. 30-in. corr. metal pipe, installed	276 l. f.	1.00	1.00	1.0
8. Mechanical tamping	95 hr.	4.00	4.00	2.0
9. Class I riprap	5 c. y.	6.00	6.00	5.0
10. Grouted riprap	10 c. y.	10.00	15.00	7.5
11. Guide posts	192 ea.	2.85	2.50	4.0
12. Timber project markers	1 ea.	15.00	15.00	10.0
13. Pit run gravel base crse. (3-in. max.)	3,100 ton	.90	1.15	1.0
14. Crushed gravel base crse. (1-in. max.)	750 ton	1.20	1.46	1.9
15. Crushed gravel surf. (¾-in max.)	1,100 ton	1.20	1.46	1.9
16. Stone chips	95 ton	3.50	5.00	3.3
17. Base treatment, MC-1	30 ton	22.00	30.00	22.5
18. Seal coat, RC-3	18 ton	22.00	30.00	25.0
19. M. C. liquid asphalt distr., MC-3	75 ton	22.00	30.00	22.5
20. Processing roadway	8,900 s. y.	.06	.07	[illegible]
21. Watering (base)	50 M gal.	1.25	2.50	3.0
22. Roller operation (base)	30 hr.	4.50	5.00	3.5
23. Shaping and tamping curb	2,850 l. f.	.075	.15	[illegible]
24. Shaping and tamping spillway	60 l. f.	1.00	.40	2.0
25. Structure excavation	10 c. y.	1.50	2.00	1.5
26. New structural steel	2,180 lb.	.20	.30	.30
27. New treated timber	40.329 M bm.	200.000	185.00	180.0
28. 4-in. pipe railing	381 l. f.	1.75	5.00	3.0
29. Transite blast plates	230 s. f.	2.00	1.50	1.4
30. Class A concrete	324.7 c. y.	23.65	25.00	24.0
31. Reinforced steel	1,800 lb.	.10	.10	[illegible]
32. Dry excavation for bridges	180 c. y.	2.00	3.00	2.5
33. Salvaged treated timber	15.487 M bm	50.00	50.00	55.0
34. Salvaged structural steel	Lump Sum	3,900.00	2,000.00	1,950.0
35. Removal of Ozone Viaduct	Lump Sum	3,400.00	3,500.00	4,200.0
36. Treated timber piling	2,724 l. f.	1.70	1.80	1.0
37. Remove three timber bridges	Lump Sum	1,500.00	1,200.00	1,400.0
38. Straight curb (concrete)	400 l. f.	1.25	1.25	1.10

BRIDGE IMPROVEMENTS, WASHINGTON

OWNER: Washington State Highway Dept., Olympia, Burwell Bantz, state highway director.

PROJECT: Grading, surfacing and widening timber bridge in Yakima County, near Moxee, Wash. Length of project is 11.72 miles. Surface course is to be of crushed stone.

CONDITIONS: Contractor to furnish all materials and complete work in 90 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $2.00 per hour; semi-skilled, $1.50; and common, $1.00.

BIDS: Three bids were received late in August, 1943, ranging from the contract low of $118,232 to $159,978.

LIST OF BIDDERS:

Bidder	Amount
1. M. J. Kuney Co., Spokane, Wash. (contract)	$118,23
2. S. Birch & Sons Constr. Co., Great Falls, Mont	132,6
3. Diesel Oil Sales Co., Seattle, Wash	159,97

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing and grading	Lump Sum	$1,200.00	$2,500.00	$1,000.0
2. Common excav., inc. haul	45,930 c. y.	.45	.60	[illegible]
3. Solid rock excav., inc. haul	1,500 c. y.	1.00	1.50	1.
4. Common trench excav., inc. haul	915 c. y.	1.00	1.00	2.
5. Structural excavation	680 c. y.	2.00	3.00	3.
6. Ballast on roadway	13,050 c. y.	1.50	1.50	2.
7. Cr. stone surf. top course	18,470 c. y.	1.85	1.95	3.
8. Cr. stone surf. top, stockpile	1,500 c. y.	1.65	1.85	2.
9. Water	4,670 M. gal.	3.50	4.75	5.
10. Cr. cover stone in stockpile	3,300 c. y.	3.00	2.05	2.
11. Conc. Class F	2 c. y.	50.00	50.00	100.
12. Timber and lumber (untreated)	2.5 Mbm.	120.00	140.00	170.
13. Pl. concr. or V. C. culv., 12-in.	180 ft.	1.35	1.40	1.
14. Std. reinf. concr. culv., 18-in.	1,728 ft.	3.00	3.00	3.
15. Std. reinf. concr. culv., 24-in.	150 ft.	4.15	4.35	4.
16. Std. reinf. concr. culv., 30-in.	127 ft.	5.05	5.85	6.
17. Std. reinf. concr. culv., 36-in.	184 ft.	7.50	7.50	9.
18. Std. reinf. concr. culv., 42-in.	88 ft.	10.50	9.35	12.
19. Std. reinf. concr. culv., 48-in.	56 ft.	12.00	11.20	13.

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COMPLETION OF VIADUCT SEATTLE, WASH.

OWNER: Washington State Highway Dept., Olympia, Wash.; Burwell Bantz, state highway director.

PROJECT: Completion of Spokane Street Viaduct in Seattle, Wash., delayed by steel shortages until preference rating ran out. Expiration of priority rating necessitated some re-designing, and also letting of new contract. Original contract involved construction of a steel, reinforced concrete and timber overcrossing structure with concrete approaches. Approximate length of project 0.8 miles.

CONDITIONS: Contractor to furnish all materials and complete balance of project in 240 days. Rail and water transportation facilities available to city of Seattle, and highway transportation to site of work. Wage rates specified are: skilled labor, $2.00 per hour; semi-skilled, $1.50; and common, $1.10.

BIDS: Bids on original project were received December 23, 1941, and on this resumption and completion on April 20, 1943. Three bids were received on the latter, ranging from $496,169 to $615,944. Same contractor who started work was low bidder on the completion work.

LIST OF BIDDERS:

1. McRae Brothers, Seattle, Wash. (contract)	$496,169
2. General Construction Co., Seattle, Wash	564,108
3. Macri Company, Seattle, Wash	615,944

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Sewer manhole with existing ring cover	Lump Sum	$200.00	$400.00	$200.00
2. Earth fill, approach ramps	2,900 c. y.	1.35	1.50	2.50
3. Cement concrete pavement, standard 14-day mix	1,575 s. y.	2.75	3.00	4.00
4. Cement conc. pavmt., std. 14-day mix	1,250 s. y.	3.00	3.40	4.00
5. Place dowel bars with caps (std.)	211 ea.	.25	.20	.20
6. Furn., place dowel bar caps	100 ea.	.25	.40	.45
7. Remove existing pavement	500 s. y.	1.25	1.50	2.00
8. Type A curbs in place	950 l. f.	.50	1.00	.75
9. Place precast white conc. curb	1,575 l. f.	.80	.40	.75
10. Furn., place precast white conc. curb	75 l. f.	2.80	4.00	1.40
11. Extra for furn. H.E.S. cement in place of standard port. cement	625 bbl.	.80	1.00	1.00
12. Special excavation	1,750 c. y.	4.00	4.00	4.00
13. Structure excavation	1,100 c. y.	3.50	8.00	10.00
14. Furn. untreated timber piling	4,700 l. f.	.28	.30	.40
15. Furn. creosoted timber piling	4,800 l. f.	.16	.70	.75
16. Drive untreated timber piles	119 ea.	13.00	20.00	30.00
17. Drive treated timber piles	130 ea.	13.00	20.00	30.00
18. Class A concrete (struct. deck steel span)	6,450 c. y.	29.00	34.00	36.00
19. Class A conc. (deck timber spans)	400 c. y.	38.00	34.00	32.00
20. Class B concrete	70 c. y.	29.00	34.00	30.00
21. Class F concrete	200 c. y.	29.00	34.00	30.00
22. Clean steel reinf. bars already placed	Lump Sum	452.00	100.00	600.00
23. Furn., place steel reinf. bars	1,885,000 lb.	.05	.05	.06
24. Clean, place steel reinf. bars	75,000 lb.	.05	.04	.05
25. Furn., fabricate, erect struct. steel	1,400,000 lb.	.085	.10	.10
26. Fabricate and erect struct. steel	184,000 lb.	.05	.055	.055
27. Erect structural steel	8,400 lb.	.035	.03	.05
28. Paint portions of exist. structures	Lump Sum	5,500.00	8,000.00	10,000.00
29. Erect cast steel	17,830 lb.	.02	.03	.10
30. Furn., install forged steel	4,500 lb.	.25	.50	.40
31. Installing forged steel	2,700 lb.	.10	.05	.20
32. Installing bridge drains	44 ea.	7.50	7.00	20.00
33. Downspouts	Lump Sum	2,650.00	4,800.00	2,200.00
34. Timber railings	7,515 l. f.	.52	.35	.50
35. Trolley protection and grd. fence	Lump Sum	1,600.00	800.00	1,858.50
36. Locomotive blast protection	Lump Sum	706.00	800.00	3,000.00
37. Lighting system, complete	Lump Sum	8,846.00	8,600.00	12,000.00
38. Remove temporary curb, barricades, rails	Lump Sum	1,965.00	3,000.00	3,000.00
39. Clean existing anchor bolt holes	(Force Acct.)	100.00	100.00	100.00
40. Reconditioning falsework, forms	(Force Acct.)	500.00	500.00	500.00

BRIDGE RECONSTRUCTION, TEXAS

OWNER: Texas State Highway Commission, Austin.

PROJECT: Reconstruction and repair of two sections of Lavaca Bay Bridge across Lavaca Bay on highway between Port Lavaca and Palacios, Texas. Portions of the timber pile trestle bridge were washed out by storm and are to be replaced. Overall length of bridge 1.979 miles. Bascule span in ce still in place and connects damaged portions.

CONDITIONS: Operations to be carried on over water w storm hazards present. Contractor to furnish all materi except reinforcing steel, and salvaged lumber and pili Project to be completed in 180 working days. Rail, high and water transportation facilities available. Wage rates a skilled labor, $1.00 per hour; semi-skilled, 60c.; common, 5

LIST OF BIDDERS: (Bids received Feb. 9, 1943)

1. J. DePuy & Sons, San Antonio, Tex. (tentative award)	$402
2. Wallace & Bowden, Norman Larson, and Lester Watson, Dallas, Tex.	427
3. Ernest Loyd, Fort Worth, Tex	430
4. Theo. Jensen & A. A. Pendergrast, Pasadena, Tex	479
5. Brown & Root, Austin, Tex	489
6. Austin Bridge Co., Dallas, Tex	502
7. Bauer-Smith Dredging Co., Port Lavaca, Tex	518
8. Heldenfels Bros., Rockport, Tex	564
9. H. B. Zachry, Laredo, Tex	576

Item	Quan.	Unit Prices (1)	(2)
1. Class A concrete	2,624.29 c. y.	$22.00	$21.00
2. Reinforcing steel	165,373 lb.	.045	.05
3. Treated timber laminated deck	390.8 M bm.	160.00	166.00
4. Treated timber caps and posts	335.9 M bm.	160.00	185.00
5. Tr. timber blocking and bridging	49.5 M bm.	160.00	195.00
6. Tr. timber railing (salts)	53.4 M bm.	160.00	200.00
7. Place salvaged timber	364.5 M bm.	50.00	75.00
8. Treated timber (3x10-in. bracing)	15,450 l. f.	.40	.50
9. Treated timber (pole bracing)	15,450 l. f.	.45	.56
10. Tr. timber piling, 32-ft	24,900 l. f.	1.50	1.54
11. Tr. timber piling, 60-ft	2,280 l. f.	1.80	1.85
12. Untreated timber piling	56,940 l. f.	.85	.83
13. Drive salvaged treated piling	16,800 l. f.	.50	.57
14. Timber piling pedestals	120 ea.	40.00	26.00
15. Timber piling splices	1,305 ea.	25.00	26.00
16. Pile top extensions	115 ea.	30.00	22.00
17. Raising timber spans	Lump Sum	8,000.00	7,000.00
18. Pull and salv. piling (32-ft. or greater)	26,658 l. f.	.65	.68
19. Pull and salvage piling (8 to 32-ft.)	8,000 l. f.	.65	.68
20. Salvage piling not usable in work	4,000 l. f.	.65	.68
21. Salvaging lumber	10 M bm.	70.00	60.00

BRIDGE, WISCONSIN

OWNER: State Highway Commission of Wisconsin, Madiso C. H. Kirch, bridge engineer.

PROJECT: Construction of Water Street Bridge in Spar Wis., on State Trunk Highways 27 and 71. Substructure a floor of bridge are concrete; steel I-beam span superstructu Length is 62½-ft.; width between curbs is 46-ft., with t ten-ft. sidewalks.

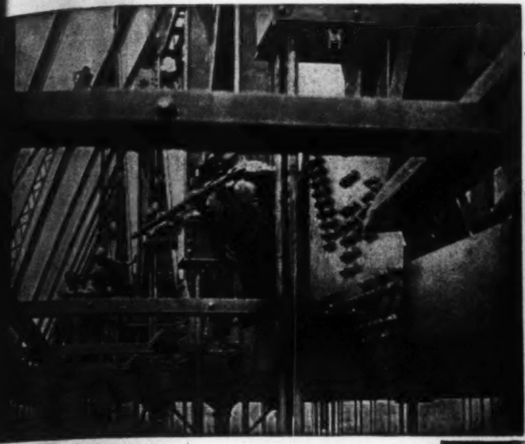
CONDITIONS: Contractor to furnish all materials. Exca tion and all concrete work (substructure) to be complet in 215 days; steel work and superstructure to be completed 90 days. Rail and highway transportation facilities availa to site of work. Wage rates are: skilled labor, $1.25 to $1. per hour; semi-skilled, 85c. to $1.60; common, 90c. to $1.

BIDS: Six bids were opened October 29, 1943, ranging fr the contract low of $56,943 to $77,955.

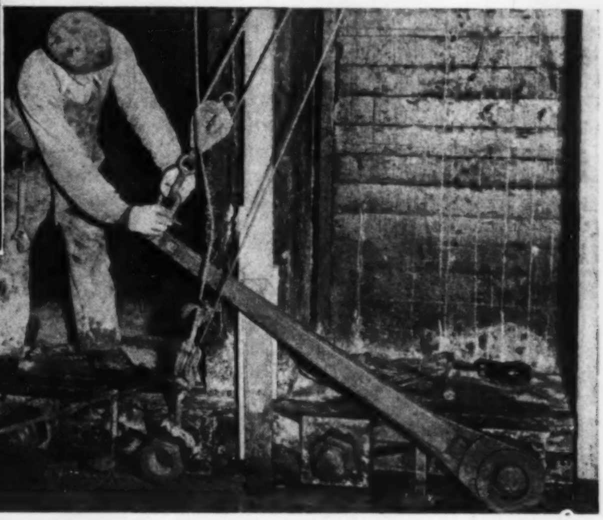
LIST OF BIDDERS:

1. I. H. Pertzsch, Onalaska, Wis. (contract)
2. C. R. Meyer & Sons Co., Oshkosh, Wis
3. Wausau Constr. Co., Wausau, Wis
4. C. B. Taylor, Decorah, Iowa
5. Brennan Bros., Lansing, Iowa
6. Eau Claire Engr. Co., Eau Claire, Wis

Item	Quan.	Unit Prices (1)	(2)
1. Excavation for structures	1,715 c. y.	$5.00	$7.20
2. Excavation for structures	1,385 c. y.	1.00	7.00
3. Concrete masonry	664.1 c. y.	25.00	28.14
4. Concrete masonry	380 c. y.	25.00	20.90
5. Bar steel reinforcing	34,480 lb.	.06	.0608
6. Bar steel reinforcing	12,700 lb.	.06	.0492
7. Structural steel	145,700 lb.	.067	.08
8. Mortar rubble masonry	12 c. y.	15.00	12.00
9. Untreated timber test pile	Lump Sum	200.00	313.06
10. Untreated timber piling	4,500 l. f.	.96	.865
11. Untreated timber piling	2,610 l. f.	.90	.865
12. Floor drains	4 ea.	20.00	16.00
13. Membrane waterproofing	270 s. f.	.25	.40
14. Membrane waterproofing	158 s. f.	.25	.40
15. Structural steel (railing)	10,170 lb.	.13	.18



For Speeding HIGHWAY Bridges



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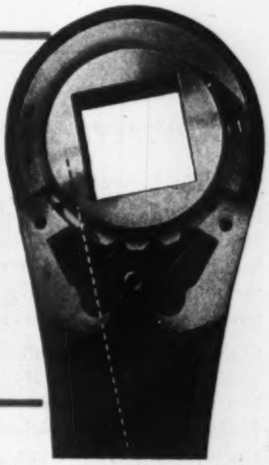

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GRADE SEPARATION, MICHIGAN

OWNER: Michigan State Highway Dept., Lansing; L. W. Millard, bridge engr.

PROJECT: Construction of reinforced concrete grade separation on Detroit Industrial Expressway over Ford Motor Company Gate No. 10, Dearborn, Wayne County, Mich. Requires two 30-ft. 3-in. and two 40-ft. 4½-in. continuous concrete T-beam spans. Roadway widths are 36-ft. and 24-ft. on north and south superstructures, with 2½-ft. rolled curbs, and two 9½-ft. shoulders.

CONDITIONS: Contractor to furnish all materials and complete work by Jan. 1, 1944. Poor soil conditions are expected to be encountered, and project is located in midst of defense areas with attendant labor shortages and high wages. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.62½ to $1.67½ per hour; semi-skilled, $1.37½; and common labor, 90c.

BIDS: Seven bids were received August 4, 1943, ranging from the contract low of $174,787 to $227,611.

LIST OF BIDDERS:

1. Fry & Kain, Lansing, Mich. (contract)	$174,787
2. Darin & Armstrong, Inc., Detroit, Mich	176,327
3. D. T. Frank, East Lansing, Mich	177,799
4. W. J. Storen Co., Detroit, Mich	183,105
5. Couse & Westphal, Detroit, Mich	187,646
6. Charles Gosner & Co., Detroit, Mich	191,847
7. Peninsular Constr. Co., Grand Rapids, Mich	227,611

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Earth excavation	17,420 c.y.	$0.80	$0.80	$0.60
2. 18-in. Class B culvert	138 l.f.	5.00	3.50	3.00
3. 6-in. perforated sewer	484 l.f.	1.25	1.00	2.00
4. 6-in. sewer	88 l.f.	1.00	2.00	1.00
5. Borrow excavation (loose measure)	1,765 c.y.	.75	.70	.60
6. Overhaul	33,105 c.y. mi.	.15	.15	.20
7. Porous backfill, Grade A (compacted)	62 c.y.	3.00	3.00	3.00
8. Unclassified excavation (struct.)	4,225 c.y.	2.75	2.75	3.00
9. Timber piles (furn. and driven)	13,860 l.f.	.90	.86	1.00
10. Cutoff—timber piles	384 l.f.	.75	.75	.75
11. Treated timber piles (furn., driven)	19,272 l.f.	1.17	1.25	1.25
12. Cutoff treated timber piles	439 l.f.	.85	.85	.85
13. Grade B concrete substructures (6A)	780 c.y.	28.00	26.50	30.00
14. Grade B concrete substructures (6B)	608 c.y.	28.00	28.00	30.00
15. Grade B concrete sub-base (6A)	578 c.y.	20.00	16.00	20.00
16. Grade B conc. superstructure (6B)	835 c.y.	28.00	30.00	25.00
17. Heat and house superstructure conc	835 c.y.	1.00	1.50	1.00
18. Cement	3,668 bbl.	2.00	2.20	2.00
19. Steel reinforcement	329,080 lb.	.0475	.05	.05
20. Rubbed surface finish	12,530 s.f.	.15	.20	.20
21. Bridge railing	589.7 l.f.	8.00	8.00	6.00
22. Heat and house bridge railing	589.7 l.f.	.50	1.00	.50
23. ¼-in. joint filler	710 s.f.	.40	.30	.50
24. ½-in. joint filler	540 s.f.	.50	.40	.50
25. ¾-in. joint filler	150 s.f.	.60	.50	1.00
26. Damp-proofing	6,000 s.f.	.05	.05	.10
27. Joint waterproofing	623 s.f.	.40	.30	.50

CONCRETE ARCH BRIDGE, INDIANA

OWNER: Indiana State Highway Commission, Indianapolis.

PROJECT: Construction of reinforced concrete arch bridge 320-ft. long over Blue River, near Edinburg, Johnson County, Ind. Bridge is four-span structure, each span 80-ft. long. Roadway width 28-ft. with walks. Work included also involves ditch paving, traffic lane stripes, and barricades.

CONDITIONS: Contractor to furnish all materials and complete work in 150 days. Rail and highway transportation facilities available. Minimum wages specified are: skilled labor, $1.00 per hour; semi-skilled, 75c.; and common, 55c.

LIST OF BIDDERS: (Bids received April 20, 1943.)

1. Smith & Johnson, Indianapolis, Ind. (contract)	$102,392
2. Curry Constr. Co., Bloomington, Ind	105,880
3. Sweet Bros. & Co., Woodburn, Ind	120,528
4. Mulzer Constr. Co., Martinsville, Ind	121,195
5. Cradle Bros., Inc., Carmel, Ind	127,832
6. R. L. Schutt, Indianapolis, Ind	131,625
7. R. P. Olinger, Huntingburg, Ind	147,489

Item	Quan.	Unit Prices (1)	(2)
1. Class D concrete	779.6 c. y.	$30.00	$24.00
2. Class E conc. above footings	772.0 c. y.	25.00	24.00
3. Class E conc. in footings	739.5 c. y.	16.00	24.00
4. Handrail	850 l. f.	4.20	4.50
5. Wet excavation	1,925 c. y.	4.00	5.00
6. Dry excavation	1,120 c. y.	.60	1.00
7. Waterway excavation	6,800 c. y.	.70	.50
8. Common excavation	445 c. y.	.60	.50
9. Special borrow	3,160 c. y.	.70	.50
10. Special filling material	6,850 c. y.	.10	.50
11. Furnish equipment for driving piles	Lump Sum	100.00	.70
12. Timber piles driven	9,600 l. f.	.30	150.00
13. Timber piles furnished	12,000 l. f.	.50	.30
14. Reinforcing steel	186,906 lb.	.06	.50
15. Rein. concrete pavement, plain	1,967 s. y.	2.60	.055
16. Pavement expansion joints	44 l. f.	.50	2.30
17. Waterproofing	2,085 s. y.	.40	.80
18. Sodding	1,020 s. y.	.30	.30
19. Special seeding	0.5 ac.	200.00	.30
20. Spec. pavement contraction joints	704 l. f.	.30	100.00
21. Guide posts, Type A	24 ea.	3.00	.50
22. Integral curb-walk	6 s. y.	5.00	2.50
23. Paved side ditch	176 l. f.	1.50	6.00
24. Special 3-ft. paved ditch	110 l. f.	3.00	1.25
25. 4-in. traffic lane stripe	0.293 mi.	300.00	2.00
26. ¼-in. preformed bitum. expan. joints	1,135 l. f.	.30	500.00
27. Standard barricades	2 ea.	50.00	.30
			50.00

BRIDGE, PRESTON COUNTY, WEST VIRGINIA

OWNER: State Road Commission of West Virginia, Charl ton.

PROJECT: Construction of Muddy Creek Bridge and a proaches in Preston County, W. Va. about four miles nor of Albright on the Kingwood-Bruceton Mills Road. Wo includes construction of three 40-ft. concrete deck girder spa on concrete substructure, and grading, draining, macada base, and asphaltic concrete surface. Alternates were allowe for concrete or masonry substructure. Award was made basis of concrete substructure.

CONDITIONS: Contractor to furnish all materials and co plete work in 100 working days. Railway transportation faci ties available to Albright, and highway facilities available site of project. Winter construction methods to be employ as cold weather is anticipated in the mountains where construction is to be done. Wage rates are: skilled labor, $1 per hour; semi-skilled, 80c. to $1.10; and common, 50c.

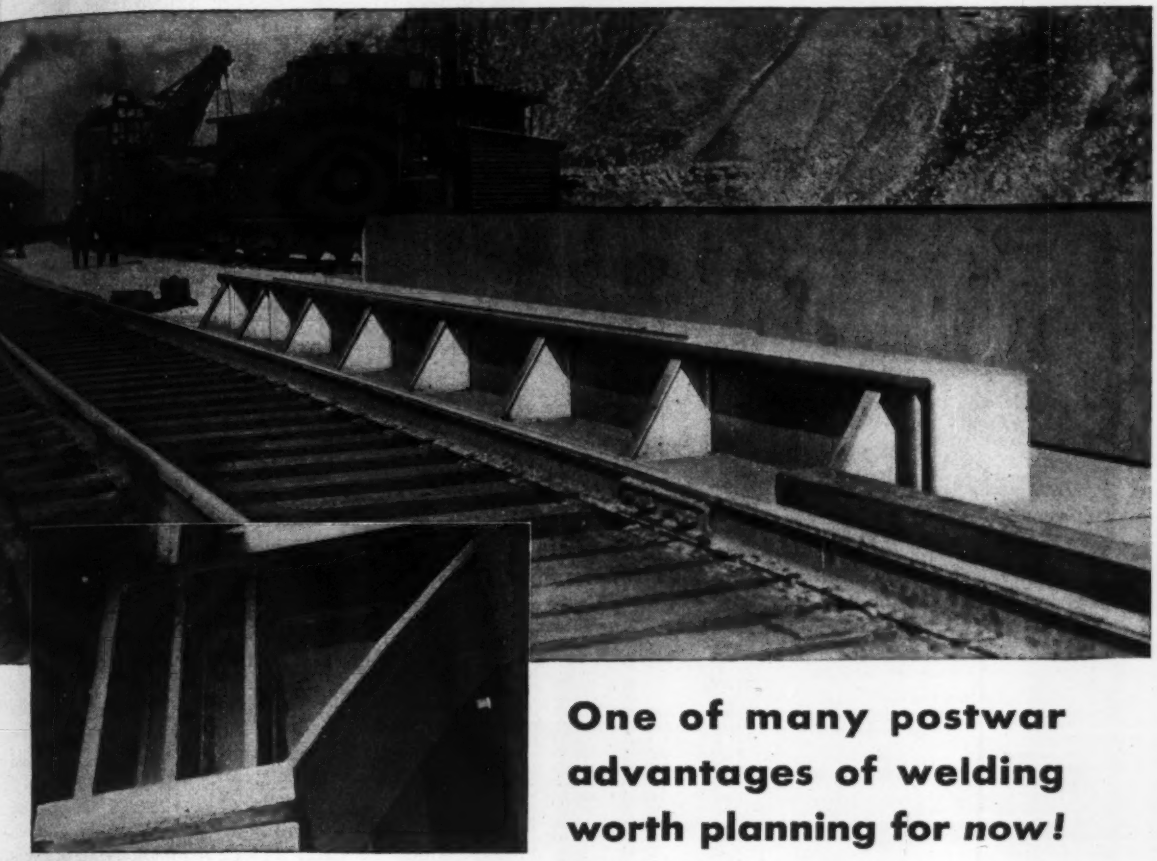
BIDS: Two bids were opened October 19, 1943, the contra low of $64,831, and $76,350.

LIST OF BIDDERS:

1. Fuccy Brothers, Weston, W. Va. (contract)	$64,8
2. J. M. Francesca & Co., Fayetteville, W. Va	76,3

Item	Quan.	Unit Prices (1)
1. Dry excavation	70 c. y.	$4.00
2. Wet excavation	500 c. y.	7.00
3. Rock excavation	17 c. y.	15.00
4. Class A concrete, superstructure	237 c. y.	32.00
5. Class A concrete, substructure	68.1 c. y.	32.00
6. Class B concrete	254.4 c. y.	30.00
7. Concrete handrail	257.2 l. f.	5.00
8. Reinforcement bars	39,285 lb.	.07
9. Dry excavation (alt.)	80 c. y.	....
10. Wet excavation (alt.)	575 c. y.	....
11. Rock excavation (alt.)	20 c. y.	....
12. Coursed stone masonry (alt.)	281.2 c. y.	....
13. Class A conc., substructure (alt.)	32.4 c. y.	....
14. Class B concrete (alt.)	66 c. y.	....
15. Reinforcing bars (alt.)	38,082 lb.	....
16. Malleable iron exp. plates	2,050 lb.	.40
17. Clearing and grubbing	6 ac.	50.00
18. Unclassified excavation	11,600 c. y.	.75
19. Borrow	3,978 c. y.	.75
20. Overhaul	25,000 sta. y.	.02
21. Structure excavation	350 c. y.	3.00
22. Macadam base course, 8-in	1,500 c. y.	6.50
23. Limestone prime coat	55 ton	7.00
24. Asphaltic conc. wearing course	280 ton	12.00
25. Tar prime	2,300 gal.	.25
26. Limestone seal coat	28 ton	7.00
27. 18-in. rein. concrete pipe	390 l. f.	3.50
28. 36-in. rein. conc. pipe	80 l. f.	8.00
29. Relaid concrete pipe	160 l. f.	1.50
30. Class B concrete	30 c. y.	35.00
31. Special rock fill	2,980 c. y.	2.50

Bridge replaced in only 5 hours!



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GRADE SEPARATION, NEW JERSEY

OWNER: New Jersey State Highway Dept., Trenton.

PROJECT: Grade separation at Port Street, Newark, Essex County, New Jersey. Involves necessary site clearing, roadway excavation (earth), removing reinforced concrete and granite block pavement, roadway paving, curbing, drainage structures, reinforced concrete structures, and all other work necessary for completion of project.

CONDITIONS: Contractor to furnish all materials. Rail and highway transportation facilities available. Minimum wage rates specified are: skilled labor, $1.20 per hour; semi-skilled, 65c.; and common, 50c.

BIDS: Five bids were received September 13, 1943, ranging from the low of $346,529 to $393,190.

LIST OF BIDDERS:

1. Union Building & Constr. Corp., Passaic, N. J. (low bidder)	$346,529
2. George M. Brewster & Son, Inc., Bogota, N. J	363,240
3. Franklin Contracting Co., Newark, N. J	366,922
4. H. L. Harrison & Son, Newark, N. J	371,650
5. S. J. Groves & Sons Co., Ridgefield, N. J	393,190

Item	Quan.	Unit Prices (1)	Unit Prices (2)
1. Clearing site	Lump Sum	$1,000.00	$750.00
2. Roadway excavation, earth	10,992 c. y.	.60	1.00
3. Pavement excav., rein. conc	2,329 s. y.	.85	.45
4. Pavement excav., granite block	5,040 s. y.	1.25	.60
5. Removal of swamp sod	4,329 c. y.	1.50	1.00
6. Borrow excavation	156,941 c. y.	.89	1.14
7. Ditch excavation	144 c. y.	2.50	1.25
8. Earth excavation, sub-surf. struct	100 c. y.	3.00	1.00
9. Topsoiling, 4-in.	33,447 s. y.	.30	.32
10. Topsoiling, 6-in.	1,569 s. y.	.34	.33
11. Macadam base course, 5-in. thick	25,237 s. y.	.75	.75
12. Waterbound macadam intermediate course, 2½-in. thick	25,237 s. y.	.50	.35
13. Pavement, Type FA-BC-2, 3-in. thick	25,237 s. y.	1.45	1.00
14. 18-in. rein. conc. culv. pipe	2,593 l. f.	2.45	2.50
15. 24-in. rein. conc. culv. pipe	630 l. f.	3.25	3.50
16. 30-in. rein. conc. culv. pipe	19 l. f.	5.00	5.00
17. Manholes, concrete tops	3 ea.	125.00	150.00
18. Special manholes, wood tops	3 ea.	120.00	150.00
19. Inlets, Type B and D (wood tops)	19 ea.	140.00	125.00
20. Inlets, Type A (wood tops)	8 ea.	140.00	125.00
21. Inlet, Type B, with exist. casting	1 ea.	100.00	100.00
22. Extra depth manholes, below 8-ft.	8 l. f.	12.00	20.00
23. Extra depth inlets, below 8-ft	8 l. f.	12.00	20.00
24. Reset inlet heads	4 ea.	10.00	20.00
25. Reset manhole heads	5 ea.	10.00	20.00
26. Grouted granite block gutter	18 s. y.	3.50	5.00
27. 7x20-in. white conc. vert. curb	13,882 l. f.	1.50	1.31
28. 15x8-in. white conc. sloping curb	502 l. f.	1.50	1.42
29. 24-in. white conc. sloping curb	1,560 l. f.	1.75	1.61
30. Reset granite curb	1,608 l. f.	1.25	1.13
31. 4-in. concrete sidewalk	112 s. y.	2.50	2.42
32. 6-in. concrete sidewalk	44 s. y.	3.10	2.96
33. 6-in. cinder sidewalk	344 s. y.	.90	.80
34. Headwalls	12 c. y.	40.00	32.00
35. Wood guard fence	1,281 l. f.	1.75	1.75
36. Reset wire rope fence	2,650 l. f.	.70	.50
37. Project marker posts	2 ea.	25.00	20.00
38. 4-in. asbestos-cement conduit (water)	200 l. f.	1.50	1.25
39. 2½-in. asbestos-cement conduit (elec.)	367 l. f.	1.25	1.00
40. Foundation excavation	536 c. y.	2.50	15.00
41. Treated timber piles	8,600 l. f.	1.50	1.45
42. Class B conc. in structures	163 c. y.	58.50	45.00
43. Class C conc. in structures	1,029 c. y.	25.00	20.00
44. Class D conc. in structures	396 c. y.	13.00	12.50
45. Concrete balustrade	137 l. f.	9.00	7.75
46. Reinforcing steel in structures	29,960 lb.	.08	.08
47. Structural steel	740 lb.	.50	.10
48. Waterproofing	520 s. f.	.50	.50
49. 1½-in. galv. wrt. iron conduit	260 l. f.	1.25	1.00

OVERHEAD BRIDGE APPROACHES WEST VIRGINIA

OWNER: West Virginia State Road Commission, Charleston.

PROJECT: Grading, draining, gravel base and concrete pavement (8-in.), in connection with construction of approaches to bridge across tracks of New York Central Railroad and Campbell Creek Railroad in Reed, Kanawha County, W. Va. Length of project is 0.451 miles.

CONDITIONS: All excavation must be hauled over detour provided by contractor, crossing tracks of N.Y.C. RR. and the Campbell Creek RR., and around operations of bridge contractor constructing the Reed overhead crossing. Contractor to furnish all materials and complete work in 175 working days. Rail and highway transportation facilities available. Minimum wage rates specified are: skilled labor, 80c. to $1.35 per hour; semi-skilled, 65 to 70c.; and common labor, 60c.

LIST OF BIDDERS: (Bids opened April 13, 1943.)

1. Smith Constr. Co., Huntington, W. Va. (contract)	$239,606
2. Price Constr. Co., Huntington, W. Va	268,307
3 Gorman Constr Co., Fleminsburg, Ky	280,539
4. T. C. Staples Constr. Co., Charleston, W. Va	294,276

Item	Quan.	Unit Prices (1)	Unit Prices (2)
1. Clearing right-of-way	3,490 l. f.	$0.20	$0.10
2. Unclassified excavation	152,200 c. y.	.74	.80
3. Overhaul	1,500,000 sta. y.	.01	.005
4. Structure excavation	4,200 c. y.	2.00	2.50
5. 6-in. gravel sub-base	2,500 c. y.	2.00	2.00
6. 2- to 4-in. courses, macadam base	175 c. y.	5.00	7.00
7. Asphaltic concrete — surface course	45 ton	12.00	20.00
8. 8-in. concrete pavement	13,850 s. y.	3.00	4.00
9. ½-in. longitudinal joint	700 l. f.	.15	.15
10. ¾-in. transverse expansion joint	1,150 l. f.	.20	.20
11. 15-in. plain concrete pipe	410 l. f.	2.00	2.00
12. 18-in. plain concrete pipe	750 l. f.	2.50	2.50
13. 24-in. plain concrete pipe	400 l. f.	4.00	4.00
14. 8-in. perforated concrete pipe	500 l. f.	1.00	1.00
15. Broken stone for underdrain	125 c. y.	5.00	3.50
16. Class B concrete	650 c. y.	17.00	25.00
17. Stone masonry	1,850 c. y.	14.00	15.00
18. Tie bars	2,700 lb.	.10	.10
19. Drop inlet castings, precast	2 ea.	30.00	50.00
20. Sidewalk inlets	5 ea.	100.00	75.00
21. Median strip drop inlets	6 ea.	100.00	75.00
22. Concrete integral curb	2,675 l. f.	.80	1.00
23. Plain concrete curb	4,200 l. f.	.80	1.30
24. Concrete sidewalks	11,000 s. f.	.35	.30
25. Guard rail posts	250 ea.	1.00	1.00
26. Grouted stone gutter	45 s. y.	4.00	5.00
27. Water for maintaining traffic	1,000 M gal.	1.00	3.00

HIGHWAY BRIDGE, VIRGINIA

OWNER: Public Roads Admin., Federal Works Agency, Arlington, Va.

PROJECT: Construction of northbound and southbound reinforced concrete bridge structures, Bridge No. 102, on Henry G. Shirley Memorial Highway, Arlington, Va., at crossing over Glebe Road. Involves necessary structural excavation, concrete, reinforcing steel, structural steel, damp-proofing, and an untreated timber bridge railing.

CONDITIONS: Contractor to furnish all materials and complete work in 150 calendar days. Hydraulic hydrated lime to be added to the concrete used in the exposed surfaces of bridges; it amounts to 6-lb. for each bag of cement required. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.50 to $2.00 per hour; semi-skilled labor, 90¢ to $1.50; and common labor, 87½¢. Preference rating for project is AA-3.

BIDS: Twelve bids were received June 8, 1943, ranging from the low of $83,654 to $117,870.

LIST OF BIDDERS:

1. Capital Excavating Co., Inc., Washington, D. C. (low bidder)	$83,654
2. Simonsen & Emerson Corp., New York, N. Y	84,742
3. Guy H. Lewis & Son, Lynchburg, Va	90,981
4. National Structures Corp., New York, N. Y	95,784
5. Potts & Callahan Contg. Co., Inc., Baltimore, Md	95,835
6. Lakeside Constr. Co., Asheville, N. C	99,015
7. David Vecellio, Roanoke, Va	101,800
8. Baltimore Contractors, Baltimore, Md	108,820
9. Tompkins Constr. Corp., New York, N. Y	110,315
10. Troitino Constr. Co., Alexandria, Va	111,583
11. Bowers Constr. Co., Raleigh, N. C	112,685
12. Laurence J. Rice, Forest Hills, N. Y	117,870

Item	Quan.	Unit Prices (1)	Unit Prices (2)
1. Unclass excavation, structures	3,300 c. y.	$3.00	$3.31
2. Concrete, class A	120 c. y.	14.00	17.125
3. Concrete, class D	2,060 c. y.	24.00	23.00
4. Reinforcing steel	365,000 lb.	.055	.061
5. Structural steel; furnished, fabricated and erected	7,000 lb.	.145	.165
6. Damp-proofing	110 s. y.	.75	1.08
7. Untreated timber railing	790 l. f.	1.85	1.07

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HIGHWAY BRIDGE, FLORIDA

OWNER: State Road Dept. of Florida, Tallahassee, J. H. Dowling, state hwy. engineer.

PROJECT: Construction of concrete and steel highway lift bridge over West Bay Creek in Bay County, Florida. Length of project 704 ft. Involves necessary clearing and grubbing; removal of existing structure; concrete for substructure, superstructure and counterweight; reinforcing steel and structural steel; machinery, castings, wire rope and wire rope attachments, and counterweight sheaves; timber and concrete piling; steel bridge floor; control house, gasoline power unit, and operator's house.

CONDITIONS: Contractor to furnish all materials and complete work in 250 working days. Rail, highway and water transportation facilities available. Prevailing wage rates to be paid.

BIDS: Five bids were opened January 18, 1944, ranging from the contract low of $250,739 to $274,305.

LIST OF BIDDERS:

1. Cleary Bros. Constr. Co., West Palm Beach, Fla. (contract)	$250,739
2. C. C. Moore Constr. Co., Inc., Panama City, Fla	266,552
3. L. J. & W. L. Cobb, Inc., Tampa, Fla	268,988
4. Royce Kershaw & Co., Panama City, Fla	274,162
5. Coggin & Deermont, Chipley, Fla	274,305

Item	Quan.	Unit Prices		
		(1)	(2)	(3)
1. Clearing and grubbing	1.616 ac.	$150.00	$200.00	$250.00
2. Removal of exist. structure	Lump Sum	5,800.00	4,000.00	3,300.00
3. Treated struct. timber (12# trtmt.)	21.5 Mbm.	248.00	200.00	300.00
4. Concrete, Class A-A, substruct	380 c. y.	54.00	47.00	49.95
5. Conc., Class A-A, superstruct	831.2 c. y.	43.00	42.00	49.95
6. Conc., Cl. A-A, counter weight	54.4 c. y.	54.00	35.00	43.82
7. Concrete handrail	1,189 l. f.	2.50	4.00	2.50
8. Reinforcing steel	233,260 lb.	.07	.055	.055
9. Structural steel	267,300 lb.	.147	.18	.165
10. Machinery and castings	Lump Sum	16,991.60	20,084.40	18,410.70
11. Wire rope and wire rope attachmts	5,700 lb.	.58	.70	.638
12. Counterweight sheaves	Lump Sum	6,148.00	7,377.60	6,762 80
13. Treated timber piling (22#)	5,400 l. f.	2.25	2.10	2.45
14. Precast conc. piling (18-in. sq.)	10,000 l. f.	6.40	7.50	7.45
15. Unloaded test piling (18-in. sq. conc.)	180 l.f.	15.00	10.00	16.00
16. Waterproofing	3,251.3 s. y.	.75	1.00	1.50
17. Steel bridge floor	2,546 s. f.	1.53	2.00	1.90
18. Control house	Lump Sum	1,525.00	2,500.00	800.00
19. Gasoline power unit	Lump Sum	2,600.00	3,120.00	2,860.00
20. Operator's house	Lump Sum	5,817.40	4,000.00	3,250.00

PUMPING STATION SUPERSTRUCTURE CHICAGO, ILL.

OWNER: City of Chicago, Dept. of Public Works; W. W. DeBerard, city engr.

PROJECT: Superstructure for low lift pumping station and chemical building, South District Filtration Plant at East Cheltenham Place and South Shore Drive, Chicago, Ill. Chemical building elevation, now 24-ft. above lake level, to be increased to 95-ft. Involves all necessary concrete work, masonry, roofing, glazing, structural steel, heating and plumbing, electrical work and other work required for completion of this contract.

CONDITIONS: Contractor to furnish all materials and com plete work in 400 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.70 to $1.825 per hour; and common, $1.10.

BIDS: Fourteen bids were received May 12, 1943, ranging from the low of $954,771 to $1,311,800. Engineer's estimate $1.100.000.

LIST OF BIDDERS:

1. S. N. Nielsen Co., Chicago, Ill. (low bidder)	$ 954,7
2. Joseph J. Duffy Co., Chicago, Ill	967,1
3. Patrick Warren Constr. Co., Chicago, Ill	968,0
4. Paschen Contractors, Chicago, Ill	984,7
5. Gust. K. Newburg Constr. Co., Chicago, Ill	1,013,9
6. W. E. O'Neil Constr. Co., Chicago Ill	1,029,0
7. J. W. Snyder Co., Chicago, Ill	1,037,2
8. Carl E. Erickson Co., Chicago, Ill	1,045,0
9. G. Kehl Sons, Chicago, Ill	1,045,8
10. William R. Goss Co., Chicago, Ill	1,051,3
11. Michuda Bros. Constr. Co., Chicago, Ill	1,109,2
12. Coath & Goss, Inc., Chicago, Ill	1,111,4
13. Michael J. McDermott & Co., Chicago, Ill	1,136,9
14. James McHugh Sons, Chicago, Ill	1,311,8

Item	Quan.	Unit Prices		
		(1)	(2)	(3
1. Concrete	6,500 c.y.	$35.00	$26 00	$25 0
2. Reinforcing steel	1,250,000 lb.	.05	.05	0
3. Heating; including boiler room equipment and accessories	Lump Sum	107,872.00	95,000.00	100,000 0
4. Ventilation	Lump Sum	3,100.00	2,300.00	2,600 0
5. Plumbing	Lump Sum	40,682.00	41,000.00	46,000 0
6. Electrical work	Lump Sum	11,200.00	11,000.00	12,000 0
7. Masonry and other apurtenant work	Lump Sum	501,917.00	586,365.00	579,275 0

RESERVOIR AND WATER MAINS, FORT WORTH, TEXAS

OWNER: City of Fort Worth, Tex., S. H. Bothwell, city ma ager; Freese & Nichols, engineers.

PROJECT: Constructing ground storage reservoir, and 24 an 30-in. cast iron water mains in Fort Worth, Tex. (FWA Dock —Tex. 41-588). Involves construction of embankment aroun reservoir walls; sub-base and fill under floor slab; necessar concreting; floor and wall expansion joints; bar and mes reinforcing; various sizes of salt glazed vitrified tile; ca iron pipe and fittings for connecting with water mains; woode manhole covers and ladders; ventilators; and valve and valv box. Also includes 9,350 linear feet of 30-in. cast iron pipe f mains, and 2,075 linear feet of 24-in. pipe with necessary fi tings and valves; and replacement of pavement after main are in place.

CONDITIONS: Contractor to furnish all materials and com plete work in 82 days. Rail and highway transportation facili ties available. Wage rates specified are: skilled labor, $1.5 per hour; semi-skilled, 75c.; and common, 50c.

BIDS: Project was divided into two parts for bidding, Schedul I for construction of the reservoir, and Schedule II for th water mains. Eighteen bids were received on Schedule I o March 30, 1943, ranging from the contract low of $91,841 t $168,077. On Schedule II eleven bids were opened on the sam date, ranging from $137,277 to $185,308.

Schedule I—Reservoir

LIST OF BIDDERS:

1. Gerald Mora, Houston, Tex. (contract)	$91,84
2. M. F. Fischer & Son, San Antonio, Tex	97,55
3. W. G. Cullum & Co., Dallas, Tex	102,51
4. Thomas S. Byrne, Inc., Fort Worth, Tex	110,06
5. Ernest Loyd, Cleburne, Tex	110,87
6. Purvis & Burton, Fort Worth, Tex	120,07
7. J. G. Bartholomew, Dallas, Tex	120,66
8. Standard Paving Co., Fort Worth, Tex	122,23
9. Quisle & Andrews, Fort Worth, Tex	128,00
10. Joe Cauker & Crow, Fort Worth, Tex	129,96
11. F. S. Oldt Co., Dallas, Tex	130,23
12. James T. Taylor & Son, Forth Worth, Tex	133,14
13. Waco Construction Co., Waco, Tex	133,18
14. R. H. Folmar, Austin, Tex	137,63
15. Ben Sira & Co., Dallas, Tex	138,15
16. Uvalde Constr. Co., and P. C. Sorenson Co., Dallas, Tex.	144,40
17 Williams & Whittle, Dallas, Tex	150,21
18. Boh Bros. Constr. Co., New Orleans, La	168,07

(*Continued on page* 209)

Item	Quan.	Unit Prices (1)	(2)	(3)
base and fill under floor slab	4,450 c. y.	$1.00	$1.51	$0.84
bankment around walls	13,800 c. y.	.60	1.04	.61
-lb. concrete in place	2,125 c. y.	12.00	10.24	12.00
-lb. concrete in place	925 c. y.	11.00	10.00	11.00
-lb. concrete in place	785 c. y	18.00	19.58	29.00
4 concrete in place	1,950 c. y.	9.50	7.00	8.00
or slab-expansion joints	1,680 l. f.	.10	.42	1.25
rtical-wall expansion joints	96 l. f.	1.00	.77	1.52
-reinforcing steel	111,500 lb.	.05	.0774	.07
sh reinforcing steel	390 hund. s.f.	1.00	6.33	4.88
. open joint salt glazed vit. pipe with pit run grav. and sand bkfill	935 l. f.	1.00	1.51	1.29
. cement joint salt glazed vit. pipe, incl. trench and bkfill	65 l. f.	1.00	1.10	1.42
in. salt glazed vit. pipe, incl. trench. and bkfill	63 l. f.	3.00	2.40	2.91
in. salt glazed vit. pipe incl. trench. and bkfill	20 l. f.	4.00	3.50	5.60
in. c. i. pipe, incl. tr. and bkfill	84 l. f.	10.00	9.10	9.90
in. c. i. pipe, incl. tr. and bkfill	72 l. f.	20.00	20.27	16.40
st iron fittings in place	0.61 ton	300.00	194.26	190.00
ooden manhole covers	6 ea.	10.00	12.00	12.50
ooden ladders	4 ea.	15.00	5.00	20.00
ntilators	4 ea.	50.00	26.25	32.00
in. gate valve, c. i. valve box	1 ea.	500.00	335.00	360.00

Schedule II—Cast Iron Water Main

T OF BIDDERS:

Gerald Mora, Houston, Tex. (contract)	$137,277
F. S. Oldt Co., Dallas, Tex.	141,205
Williams & Whittle, Dallas, Tex	143,807
Glade Construction Co., Fort Worth, Tex	147,085
Ben Sira & Co., Dallas, Tex	156,423
W. G. Cullum & Co., Dallas, Tex	157,140
Ernest Loyd, Cleburne, Tex	159,306
Waco Construction Co., Waco, Tex	164,827
Uvalde Constr. Co., and P. C. Sorenson, Dallas, Tex.	166,044
M. F. Fischer & Son, San Antonio, Tex	168,925
Boh Bros. Constr. Co., New Orleans, La	185,308

Item	Quan.	Unit Prices (1)	(2)	(3)
-in. cast iron pipe, incl. tr. and bkfill	9,350 l. f.	$10.00	$11.00	$11.20
above, 24-in	2,075 l. f.	8.00	8.50	8.20
above, 20-in	40 l. f.	8.00	7.00	7.50
st iron fittings, installed	18 ton	300.00	225.00	200.00
-in. gate valves, installed	6 ea.	800.00	700.00	680.00
-in. gate valves, installed	1 ea.	500.00	450.00	410.00
-in. gate valves, installed	2 ea.	150.00	125.00	120.00
-in. gate valves, installed	1 ea.	125.00	100.00	95.00
lve manholes	7 ea.	100.00	225.00	260.00
st iron valve boxes, installed	3 ea.	20.00	10.00	7.00
t-in to exist. 30-in. c. i. water line	Lump Sum	600.00	250.00	170.00
t-in to exist. 20-in. line	Lump Sum	600.00	250.00	170.00
t-in to exist. 12-in. line	Lump Sum	600.00	300.00	170.00
t-in to exist. 10-in. line	Lump Sum	500.00	150.00	60.00
orm sewer crossing Sta. 6+17	Lump Sum	400.00	300.00	120.00
orm sewer crossing, Sta. 33+78	Lump Sum	350.00	300.00	170.00
ilroad crossing, Sta. 95+00	Lump Sum	400.00	500.00	120.00
place 6-in. conc. base and 2-in. asph. pavmt.	170 s. y.	3.00	3.00	4.50
place flex. grav. base and asph. pavmt	80 s. y.	2.00	2.00	1.75
place 6-in. conc. base, 2-in. rock asph. pavmt	1,475 s. y.	3.00	3.00	4.20
place 6-in. conc. base and 2½-in. vertical fiber brick pavmt	35 s. y.	3.00	4.50	6.00
ck excavation	300 c. y.	20.00	3.50	10.00
erdepth earth excav., reservoir approach	50 c. y.	1.00	2.00	1.00
mber ordered left in trenches	2 M bm.	100.00	75.00	23.00
4 conc. cradle and backing	12 c. y.	6.00	15.00	10.00

CONCRETE RESERVOIR SALT LAKE CITY, UTAH

NER: City of Salt Lake City, Utah; W. D. Beers, city neer.

JECT: Constructing the Louis Marcus Reservoir and rtenant structures, 3rd East St. and Gordon Lane in Salt County, Utah. The concrete reservoir is to have 3,000,- gallon capacity and is to be half embankment and half vation, with sloping sides of concrete, and a timber roof.

DITIONS: City to furnish cast iron pipe and fittings, valves, and altitude control valve. Contractor to furnish other materials and complete work in 90 days. Highway sportation facilities available to site of work. Prevailing rates are: skilled labor, $1.25 to $1.40 per hour; semi- ed, 90c. to $1.00; and common labor, 65c.

S: Seven bids were received May 25, 1943, ranging from contract low of $74,968 to $96,232.

LIST OF BIDDERS:

1. Enoch Smith & Sons Co., Salt Lake City, Utah (contract)	$74,968
2. W. W. Clyde & Co., Springville, Utah	81,329
3. Olson & Lucas Constr. Co., Salt Lake City, Utah	84,653
4. Gibbons & Reed Co., Salt Lake City, Utah	89,977
5. George M. Carruth & Son, Evanston, Wyo	92,483
6. F. R. Knowlton, Layton, Utah	95,869
7. J. B. & R. E. Walker, Salt Lake City, Utah	96,232

Item	Quan.	Unit Prices 1)	(2)	(3)
1. Excav. and embankment (incl. upper section of waste water trench)	5,400 c. y.	$0.50	$0.48	$1.50
2. Excav. and waste (incl. grad. and embankment for access road)	6,900 c. y.	.50	.40	.35
3. Fine grading and excav. for rib trenches and reservoir drains	1,150 c. y.	2.00	2.00	2.30
4. Excav. and drainage (outside reservoir)	230 c. y.	1.50	2.00	1.15
5. Excav., bkfill. of waste water trench from collecting box to creek	450 c. y.	1.50	2.00	1.15
6. Excav., bkfill. for outlet wks. and valve box	600 c. y.	1.50	2.00	2.30
7. Excavation for structures	200 c. y.	1.50	2.00	1.15
8. 6-in. b. & s. vitr. pipe, open joints	820 l. f.	.40	.51	1.75
9. 18-in. b. & s. conc. pipe, tight joints	600 l. f.	2.00	2.00	2.00
10. Gravel in trenches, under reservoir floor	900 c. y.	3.00	2.75	3.75
11. Reinforced concrete	1,170 c. y.	22.00	28.12	25.00
12. Plain concrete	115 c. y.	19.00	18.00	35.00
13. Galvanized iron water stops	4,200 l. f.	.80	.85	.65
14. Valve chamber, complete	Lump Sum	1,500.00	1,200.00	650.00
15. Collecting box, complete	Lump Sum	1,500.00	775.00	550.00
16. Roof, complete (incl. lumber, timber, hardware and roofing)	Lump Sum	20,424.00	21,335.40	21,629.81
17. Lay 24-in. c. i. pipe and fittings	100 l. f.	4.00	4.00	1.12
18. Lay 18-in. c. i. pipe and fittings	130 l. f.	4.00	3.00	1.10
19. Lay 16-in. c. i. pipe and fittings	64 l. f.	3.00	3.00	.98
20. Lay 6-in. c. i. pipe and fittings	155 l. f.	1.00	.75	.94
21. 24-in. o. d. welded steel pipe, incl. c. i. flange and welded conn. to 36-in. line	Lump Sum	500.00	338.00	100.00
22. Set 24-in. gate valve (furnished)	1 ea.	50.00	50.00	75.00
23. Set 16-in. altitude control valve	Lump Sum	150.00	40.00	75.00
24. Set 18-in. gate valve	Lump Sum	50.00	45.00	60.00
25. Set 4-in. gate valve	Lump Sum	10.00	5.00	40.00
26. Gravel on access road	250 c. y.	2.00	2.00	2.88
27. 15-in. b. & s. vit. pipe, cem. joints	227 l. f.	2.00	1.75	2.75
28. 8-in. vit. pipe, as above	210 l. f.	1.00	.80	2.25
29. Four-strand barb-wire fence	140 rod	2.00	2.50	3.00
30. Screen over outlet pipe	Lump Sum	50.00	35.00	100.00
31. Conc. gutters on north and south sides of reservoir for roof drainage and making pipe connection	Lump Sum	500.00	688.00	335.00
32. Asphalt and oakum in expan. joints	5 ton	100.00	100.00	50.00
33. Riprap at outlet to waste pipe	100 s. y.	5.00	3.00	1.00
34. 12-in. corr. iron pipe	50 l. f.	2.00	1.50	3.00
35. 1½-in. galv. iron pipe and fittings	Lump Sum	50.00	17.00	60.00
36. Cast iron frames and covers	3 ea.	30.00	39.00	37.00
37. Delivery of irrigation water	Lump Sum	100.00	50.00	100.00

DAM AND DIKE, CALIFORNIA

OWNER: California Water & Telephone Co., San Francisco, Clayton B. Neill, chief engr.; Loveland Engineers, San Francisco, consulting engineers.

PROJECT: Construction of concrete variable arch dam across Sweetwater River, 20 miles east of Chula Vista, San Diego County, Calif. Dam about 190 feet in height to center section of spillway; crest length approximately 614 feet. Project is for water supply.

CONDITIONS: Contractor to furnish all materials except cement which is to be supplied by owner; time for completion 270 days. Project is located in very rough canyon country. Highway transportation facilities available to site of work. Wage rates are $1.00 to $1.75 per hour for skilled labor; 95c. to $1.375 for semi-skilled; and 87½c. for common.

BIDS: Seven bids were received August 14, 1943, ranging from the low of $1,114,447 to $1,515,970. Contract was awarded to second low bidder, as the low bidder stipulated that $10,000 plus $0.044 for each cubic yard of concrete, should be added to his bid to provide for pre-cooling of water for concrete. Bidder who received award stipulated an additional charge of 50c. per cu. yd. for each yard excavation quantity is reduced, and $3.00 per cu. yd. for each yard mass concrete quantity is reduced. One bid was irregular and is not listed below. Bids on slide gate, valves and electrical wiring items not revealed.

LIST OF BIDDERS:

1. L. E. Dixon Co., Los Angeles, Calif	$1,114,447

(Continued on page 210)

DAM AND DIKE, CALIF. (cont'd)

2. Macco Constr. Co., Clearwater, Calif., (contract)	1,114,890
3. A. S. Vinnell Co., and Engineers Ltd., Alhambra, Calif.	1,199,891
4. Ralph A. Bell, San Marino, Calif	1,241,300
5. Morrison-Knudsen Co., Inc., Los Angeles, Calif	1,482,980
6. Bressi & Bevanda Constructors, Inc., Los Angeles Calif.	1,515,970

Schedule I — Dam

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	75,000 c. y.	$4.70	$3.65	$3.75
2. Backfill	6,000 c. y.	.70	.75	2.00
3. Drill grout holes, 0 to 25-ft	4,000 l. f.	1.75	2.55	2.30
4. Drill grout holes, 25 to 50-ft	1,300 l. f.	1.75	2.55	2.67
5. Drill grout holes, 50 to 75-ft	500 l. f.	1.75	2.55	3.05
6. Drill grout holes, 75 to 100-ft	200 l. f.	1.75	2.55	3.80
7. Foundation grout piping	10,000 lb.	.30	.20	.80
8. Grouting foundation	7,000 c. f.	1.20	2.20	2.25
9. Grout pipe, contraction joints	9,000 lb.	.35	.30	.80
10. Grouting contraction joints	700 c. y.	4.50	7.25	7.00
11. Mass concrete, Class A	73,000 c. y.	9.27	10.00	10.72
12. Reinforced concrete, Class B	200 c. y.	38.75	40.00	60.00
13. Reinforcing steel	60,000 lb.	.058	.08	.10
14. Water and grout stops	4,600 lb.	1.07	.45	1.00
15. Trash racks	14,000 lb.	.12	.22	.20
16. Slide gate	1 ea.	......	......	......
17. Steel sluiceway piping	13,000 lb.	.31	.45	.50
18. Cast iron sluiceway piping	22,000 lb.	.095	.15	.50
19. Butterfly valve	1 ea.	......	......	......
20. Needle valve	1 ea.	......	......	......
21. Hand railing	12,500 lb.	.30	.22	.30
22. Electric conduit and wiring	Lump Sum	......	......	......
23. Misc. structural steel	1,200 lb.	.40	.70	.50

Schedule II — East Saddle Dike

Item	Quan.	(1)	(2)	(3)
24. Stripping for embankment	900 c. y.	1.00	.70	.75
25. Stripping from borrow pits	600 c. y.	1.00	.70	.75
26. Earth fill in embankment	6,400 c. y.	.90	1.45	1.00
27. Rock blankets	1,600 c. y.	2.00	2.20	5.00

WATER LINE, CLEVELAND

OWNER: City of Cleveland, Ohio; A. G. Levy, Cleveland, engineer.

PROJECT: Installation of concrete pipe water line along St. Clair Avenue, from London Road to East 222 Street in Cleveland, Ohio. Involves laying of 9,500 linear feet of 48-in. concrete pipe; 850 linear feet of 30-in. concrete pipe; and 7,300 linear feet of 24-in. concrete pipe.

CONDITIONS: Owner to furnish concrete pipe and contractor to furnish all labor, equipment, and other materials incidental to completion of project. Highway transportation facilities available. Completion time allowed is 210 days. Wage rates are: skilled labor, $1.55 to $1.875 per hour; semi-skilled, $1.00 to $1.50; and common, $1.00.

BIDS: Five bids were received July 16, 1943, ranging from the low of $197,800 to $244,840.

LIST OF BIDDERS:

1. Curro Construction Co., Cleveland, Ohio (low bidder)	$197,800
2. National Constr. Co., Cleveland, Ohio	213,450
3. Mike Fatol, Cleveland, Ohio	216,000
4. Lock Joint Pipe Co., Cleveland, Ohio	219,000
5. Seth Haddad, Cleveland, Ohio	244,840

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 48-in. concrete pipe	9,500 l. f.	$16.25	$17.75	$14.00
2. 30-in. concrete pipe	850 l. f.	6.00	5.50	12.00
3. 24-in. concrete pipe	7,300 l. f.	5.25	5.50	10.00

CLEAN AND LINE WATER MAINS NEW JERSEY

OWNER: City of Newark, N. J.; William Banks, engr.

PROJECT: Cleaning and relining 78,000 feet of 48-in. riveted steel pipe in water line between Macopin Intake and West Paterson, N. J. Pipe to be lined with 3/8-in. protective coating of cement mortar. From the intake, water line passes thro Pequannock, Butler, Kinnelon, West Milford, Wayne, Li Falls, Totowa, and West Paterson.

CONDITIONS: Contractor to furnish all materials, and specific time for completion is stipulated. Highway transp tation facilities available. Wage rates range from 87½c. common labor to $1.50 for skilled labor.

BIDS: Four bids were opened March 16, 1943, but two w irregular. Regular bids were the low of $226,200 and $273.0

LIST OF BIDDERS:

1. J. Nesto & Co., Newark, N. J (low bidder)	$226.2
2. Lock-Joint Pipe Co., Newark, N. J	273.0

Item	Quan.	Unit Pric (1)
1. Cleaning and lining 48-in. water pipe with 3/8-in. protective coating of cement mortar	78,000 l.f.	$2.90

WATERWORKS AND SEWERAGE SYSTE PORT NECHES, TEXAS

OWNER: Federal Works Agency, Fort Worth, Tex.

PROJECT: Construction of waterworks system and sewera system in Port Neches, Tex. including filtration plant co plete with mixing chamber, settling basins, filters, clear we all pumps and equipment ready for operation; pump ho complete with pumps and equipment and power line; inta mains, pipe and fittings; vitrified clay sewer lines and fitting manholes; concrete headwalls at river outlet; and sewer station with pumps and equipment ready for use.

CONDITIONS: Contractor to furnish all materials and co plete work in 120 calendar days. Considerable wet trenchi is expected to be encountered due to the location of the proje Rail, water and highway transportation facilities available transportation. Wage rates are: skilled labor, $1.75 hour; semi-skilled, $1.25; and common, 60c.

BIDS: Six bids were received October 6, 1943. Four of five contractors bid on all three schedules, and one bid on first and second schedules and one on the second and third. L bid on the combination of the three schedules was $169,539 the high was $200,000.

LIST OF BIDDERS:

(Combination of three schedules).

1. Thomas Bates & Son, Houston, Tex. (low bidder)	$169.5
2. Williams & Whittle, Inc., Dallas, Tex	176.9
3. Hake Constr. Co., Houston, Tex	193.0
4. English & Wilson, San Antonio, Tex	200.0

Sections I and II

1. Mitchell Darby, Pharr, Tex	$133.0
2. English & Wilson, San Antonio, Tex	145.0
3. Hake Constr. Co., Houston, Tex	152.0

Sections II and III

1. Hake Constr. Co., Houston, Tex	$88.
2. Beaumont Constr. Co., Beaumont, Tex	99.0
3. English & Wilson, San Antonio, Tex	110.0

Section I—Filtration Plant

Item	Quan.	Unit Prices (1)	(2)
1. Filtration plant, complete with mixing chamber, settling basins, filter, clear well, all pumps and equipt., ready for operation	Lump Sum	$67,000.00	$80,000.00

Section II—Pump House and Water Lines

Item	Quan.	(1)	(2)
1. Canal pump house, complete with pumps and equipment, and power line	Lump Sum	8,340.00	7,600.00
2. 12-in. cast iron pipe line	2,400 l. f.	4.00	3.36
3. 10-in. cast iron pipe line	580 l. f.	3.30	2.70

(*Continued on page* 212)

10 IMPORTANT REASONS *for* SPECIFYING GRAVER ZEOLITE WATER SOFTENERS

e purchase of a Zeolite Water Softener should be considered efully, not only from the standpoint of initial cost, but also regards performance, dependability, and operating economy. en you are ready to make your selection, give careful thought very angle . . . or better yet, check your requirements against se 10 important advantages of Graver Zeolite Water Softeners:

Vater of zero hardness (standard soap test) or other predeter- ed degrees of hardness as desired.

Uniform collection and distribution of water, from and to the lite bed, accomplished by means of a reinforced steel plate dis- utor diaphragm, inset with strainer nozzles on 6″ centers, under entire bed.

Choice of manual, semi-automatic or full automatic operation.

Unaffected by flow-rate variations, under the specified limit.

Silent, thorough operation with a minimum of attention.

Choice of correct Zeolites for most efficient and economical oper- n.

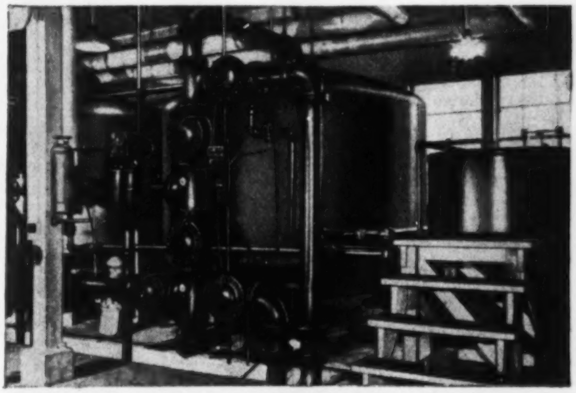
All welded construction; adequate manholes, reinforced openings piping; adjustable supporting legs.

Comparatively low initial cost and small operating cost.

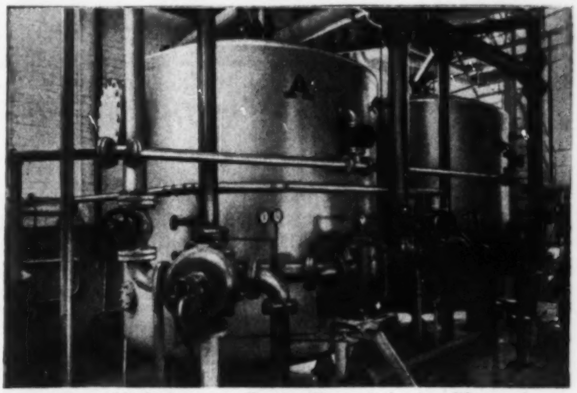
Minimum space requirements.

Designed, built, installed, or installation supervised, by Graver eet your specific needs. Complete service and undivided respon- ity.

ver engineers welcome the opportunity to discuss water ditioning questions with you, and invite your correspondence. re's no obligation.



Graver Fully Automatic Zeolite Water Softening Plant.



Graver High Capacity Zeolite Water Softening Plant, Double Unit.

GRAVER

WATER CONDITIONING EQUIPMENT

Process Equipment Division of
GRAVER TANK & MFG. CO., INC.
4809-93 Tod Ave., East Chicago, Indiana
NEW YORK CATASAUQUA, PA. CHICAGO TULSA

WATERWORKS, SEWERAGE, TEX. (cont'd)

4. 6-in. cast iron pipe line	10,260 l. f.	2.30	1.64	1.80
5. 3-in. cast iron pipe line	4,900 l. f.	1.80	1.13	1.20
6. 12x12x12x12-in. c. i. cross, all bell	1 ea.	63.00	60.00	77.50
7. 90-deg. c. i. ell, bell to bell	3 ea.	37.00	36.00	42.00
8. 12 to 6-in. c. i. reducer, bell to spigot	1 ea.	22.00	20.00	31.80
9. 6-in. cast iron tee, all bell	30 ea.	20.00	18.00	21.00
10. 6-in. cast iron sleeve	1 ea.	13.00	8.00	7.40
11. Cast iron tee, 12x6x12-in.	1 ea.	46.00	40.00	48.75
12. Cast iron tee, 10x8x10-in. all bell	1 ea.	36.00	33.00	43.35
13. Cast iron cross, 10x10x6x6-in., all bell	1 ea.	41.00	36.00	55.10
14. Cast iron tees, 6x4x6-in., all bell	3 ea.	18.00	18.00	13.50
15. Cast iron cross, 6-in., all bell	2 ea.	26.00	24.00	35.20
16. Cast iron cross, 6x6x4x4-in., all bell	2 ea.	22.00	20.00	30.95
17. 22½-deg. 6-in. c. i. ell	2 ea.	14.00	10.00	13.80
18. 22½-deg. 3-in. c. i. ell	1 ea.	7.00	6.00	8.80
19. 10x6-in. c. i. reducer	1 ea.	18.00	28.00	22.90
20. 6x4-in. c. i. reducer	7 ea.	12.00	10.00	11.20
21. 6x3-in. c. i. reducer	6 ea.	11.00	9.00	11.30
22. 4x2-in. c. i. reducer	6 ea.	5.00	5.00	6.80
23. 8-in. cast iron sleeves	1 ea.	12.00	10.00	11.75
24. 6-in. cast iron sleeves	9 ea.	9.00	8.00	9.10
25. 4-in. cast iron sleeves	6 ea.	6.00	6.00	7.50
26. 6-in. cast iron plugs	3 ea.	2.00	3.00	3.40
27. 12-in. check valves, bell	2 ea.	180.00	160.00	235.00
28. 6-in. check valve	1 ea.	50.00	50.00	51.75
29. 12-in. gate valves	2 ea.	135.00	140.00	151.25
30. 10-in. gate valve	1 ea.	110.00	100.00	122.50
31. 8-in. gate valve	1 ea.	72.00	70.00	80.00
32. 6-in. gate valves	17 ea.	50.00	50.00	50.00
33. 4-in. gate valves	2 ea.	38.00	40.00	33.75
34. 3-in. gate valves	2 ea.	33.00	30.00	28.75
35. Hydrants	16 ea.	110.00	110.00	128.75

Section III—Sewer Line and Lift Station

1. 6-in. vit. clay sewer line, 0 to 4-ft.	3,660 l. f.	.90	.80	84
2. 6-in. vit. clay sew. line, 4 to 6-ft.	2,030 l. f.	1.10	.95	1.04
3. 6-in. vit. clay sew. line, 6 to 8-ft.	330 l. f.	1.50	1.30	1.24
4. 8-in. vit. clay sew. line, 0 to 4-ft.	280 l. f.	1.50	1.00	1.06
5. 8-in. vit. clay sewl line, 4 to 6-ft.	225 l. f.	1.60	1.20	1.26
6. 8-in. vit. clay sew. line, 6 to 8-ft.	425 l. f.	1.80	1.50	1.46
7. 10-in. vit. clay sew. line, 8 to 10-ft.	870 l. f.	3.10	5.00	1.98
8. 10-in. cit. clay sew. line, 10 to 12-ft.	1,435 l. f.	3.20	5.10	2.18
9. 12-in. vit. clay sew. line, 0 to 4-ft.	1,365 l. f.	2.00	1.50	1.86
10. 12-in. vit. clay sew. line, 4 to 6-ft.	350 l. f.	3.00	1.70	2.01
11. 12-in. vit. clay sew. line, 6 to 8-ft.	260 l. f.	3.10	2.10	2.38
12. 12-in. vit. clay sew. line, 8 to 10-ft.	775 l. f.	3.20	5.10	2.73
13. 12-in. vit. clay sew. line, 10 to 12-ft.	1,525 l. f.	3.40	5.30	2.94
14. 12-in. vit. clay sew. line, 12 to 14-ft.	1,740 l. f.	3.60	5.60	3.26
15. 6-in. wyes with plugs	180 ea.	2.00	2.00	1.50
16. 8-in. wyes with plugs	10 ea.	2.50	2.50	2.60
17. 10-in. wyes with plugs	15 ea.	3.00	3.00	3.65
18. 12-in. wyes with plugs	64 ea.	3.50	4.00	4.50
19. 5-ft. chimneys, 6-in. plugs	20 ea.	12.00	2.00	7.50
20. Manhole, with cover, 0 to 4-ft.	14 ea.	80.00	75.00	70.00
21. Manhole, with cover, 4 to 6-ft.	5 ea.	90.00	82.00	75.00
22. Manhole, with cover, 6 to 8-ft.	2 ea.	100.00	90.00	115.00
23. Manhole, with cover, 8 to 10-ft.	6 ea.	120.00	97.00	145.00
24. Manhole, with cover, 10 to 12-ft.	11 ea.	140.00	104.00	187.50
25. Manhole, with cover, 12 to 14-ft.	2 ea.	160.00	112.00	245.00
26. Conc. in headwalls at river outlet	5 c. y.	65.00	50.00	30.00
27. 12-in. cast iron pipe at river outlet	32 l. f.	6.00	10.00	7.80
28. Sewer lift station, complete with pumps and equip. connected and ready for use	Lump Sum	6,070.00	4,500.00	7,000.00

SEWER TUNNEL, MICHIGAN

OWNER: Oakland County, Michigan; Hubbell, Roth & Clark, Inc., Detroit, consulting engineers.

PROJECT: Construction of concrete tunnel sewer and appurtenances in southeast Oakland County (Southeast Oakland County Sewage Disposal District) to connect with sewer system of the City of Detroit, Mich. Involves construction of 31,575 l.f. of 5½-ft. concrete tunnel sewer; 3,297 l.f. of 2-ft. 8-in. by 4-ft. concrete sewer; alignment holes; manholes; regulator chambers; and pumping station. All concrete to be transit-mixed.

CONDITIONS: Contractor to furnish all materials. Rail and highway transportation facilities available. Wage rates stipulated are: skilled labor, $1.75 per hour; semi-skilled, $1.25 to $1.50; and common, 87½c.

BIDS: Project was divided into four sections, results for three of which are shown in the tabulation below. Bids were originally asked in early 1942, but held up until March, 1943, when it was awarded as noted below.

Section I

LIST OF BIDDERS:

1. Gargaro Co., Inc., Detroit, Mich. (contract)	$390,5
2. N. D. Mancini & Square Constr. Co., Baltimore, Md	413,2

Item	Quan.	Unit Prices (1)
1. 5½-ft. concrete tunnel sewer	11,967 l. f.	$32.00
2. Alignment holes	700 l. f.	4.00
3. Manholes	12 ea.	400.00

Section II

LIST OF BIDDERS

1. Frank J. Knight Co., Centerline, Mich. (contract)	$352,1
2. N. D. Mancini & Square Constr. Co., Baltimore, Md	368,7
3. Gargaro Co., Inc., Detroit, Mich	370,0

Item	Quan.	Unit Prices (1)	(2)
1. 5½-ft. concrete tunnel sewer	12,069 l. f.	$28.50	$30.00
2. Manholes	13 ea.	360.00	300.00
3. Alignment holes	700 l. f.	5.00	4.00

Section III

LIST OF BIDDERS:

1. N. D. Mancini & Square Constr. Co., Baltimore, Md. (contract)	$393,9
2. Frank J. Knight Co., Centerline, Mich	402,8

Item	Quan.	Unit Prices (1)
1. 5½-ft. concrete tunnel sewer	7,539 l. f.	$34.00
2. 2' 8" by 4' concrete tunnel sewer	3,297 l. f.	22.00
3. Manholes	11 ea.	300.00
4. Alignment holes	700 l. f.	4.00
5. Regulator chamber, complete	Lump Sum	45,000.00
6. Regulator chamber, complete	Lump Sum	14,000.00

SEWERAGE SYSTEM, SENECA, ILL.

OWNER: Federal Works Agency, Chicago; McCoy & Mulfo Chicago Heights, engr.

PROJECT: Construction of sewage treatment plant (Imh tank); sewers, both lateral and intercepting, ranging from 6 18-in.; necessary manholes; replacement of pavement; and i stallation of 3-in. cast iron watermain; at Seneca, Ill.

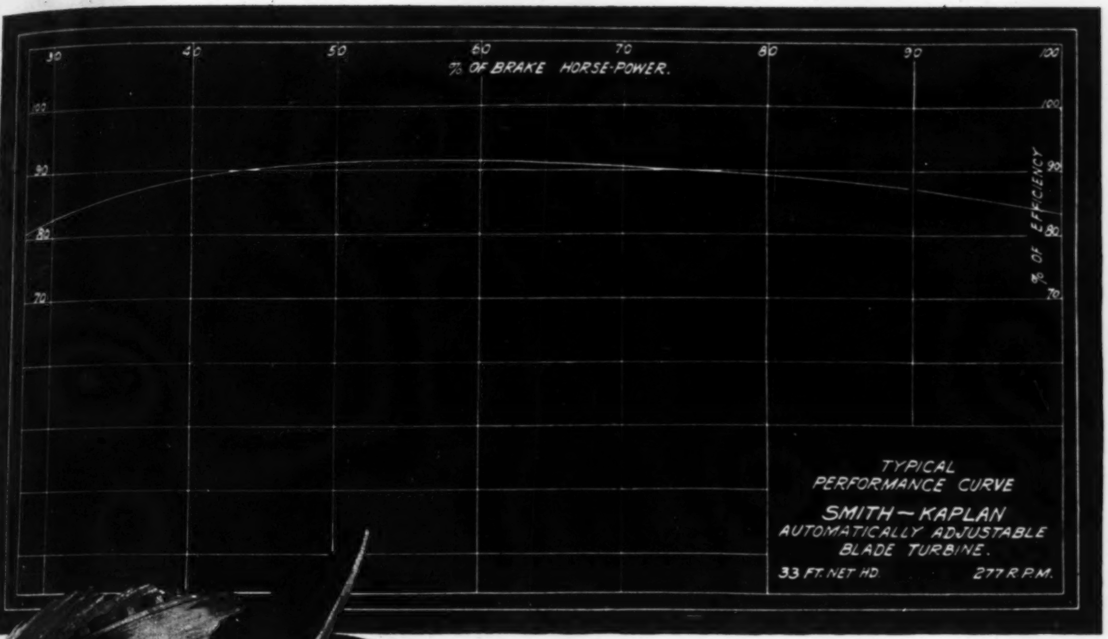
CONDITIONS: Contractor to furnish all material and compl work in 200 days. Work involves large amount of rock exca tion. Rail and highway transportation facilities available. Wa rates are: skilled labor, $1.25 to $1.75 per hour; semi-skill $1.125 to $1.60; and common labor, 90c. to $1.00.

BIDS: Twelve bids were received December 17, 1943, rangi from the contract low of $135,886 to $237,223.

LIST OF BIDDERS:

1. Arcole Midwest, Chicago, Ill. (contract)	$135,8
2. Gjellafold Constr. Co., Forest City, Iowa	137,2
3. Mancini & Ventrella, Chicago, Ill	138,9
4. Elmer Gust, Oshkosh, Wis	143,6
5. Santucci Constr. Co., Skokie, Ill	154,6
6. D. L. Amici Co., Stone Park, Ill	156,6
7. Joseph J. Duffey Co., Chicago, Ill	164,8
8. George D. Hardin, Chicago, Ill	168,5
9. E. H. Marhoefer, Jr., Co., Chicago, Ill.	173,7
10. T. F. Clogessy Constr. Co., Hammond, Ind	203,0
11. United Constr. Co., Grand Rapids, Mich.	227,1
12. Public Constr. Co., Hammond, Ind	237,2

Item	Quan.	Unit Prices (1)	(2)
1. Sewage treatment plant	Lump Sum	$29,500.00	$29,800.00
2. Rock excavation	6,100 c. y.	6.10	7.00
3. 18-in. sewer	1,500 l. f.	3.88	3.00
4. 15-in. sewer	140 l. f.	4.80	6.00
5. 12-in. sewer	3,084 l. f.	2.68	2.50
6. 10-in. sewer	3,252 l. f.	3.49	2.00
7. 8-in. sewer	13,571 l. f.	1.60	1.50
8. 6-in. sewer	3,000 l. f.	1.31	1.50
9. 12-in. cast iron sewer	200 l. f.	4.87	7.00
10. 10-in. cast iron sewer	130 l. f.	6.58	6.00
11. 8-in. cast iron sewer	500 l. f.	3.44	5.00
12. 6-in. cast iron sewer	750 l. f.	2.56	3.00
13. Manholes	93 ea.	90.00	100.00
14. 6-in. macadam road replacement	877 s. y.	1.70	3.00
15. 3-in. cast iron watermain	900 l. f.	2.20	1.50



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NONCONNAH BASIN SEWERS MEMPHIS, TENN.

OWNER: Dept. of Public Works, Memphis, Tenn.; W. B. Fowler, city engineer.

PROJECT: Constructing and improving 9 miles of sanitary sewers from Getwell along Nonconnah Creek to Tennessee Chute, Shelby County, Tenn. Project was divided into three sections for speed in completion. Concrete sewer and culvert pipe used throughout. (Project No. Tenn. 40-242 N.F.)

CONDITIONS: Contractor to furnish all material except for manhole rims which are to be furnished by city, and is to complete work in 150 calendar days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.25 to $1.625 per hour; semi-skilled, 60c. to $1.00; and common labor, 45c.

BIDS: Bids on all sections were originally asked April 27, 1943. These were all rejected as being too high because when the contractors visited the site the Mississippi River was at flood stage and most of the area through which the sewer passes was covered with water. Bids were again asked on May 11, 1943 with the low bidders on Sections II and III receiving contracts. Bids on Section I were rejected at that time. On June 22, 1943 bids were opened on a modified and curtailed version of Section I with F. D. Harvey of Memphis, Tenn., receiving the award, the price being $115,512. Results of the June 22 and the May 11 openings are shown below with all of the bidders listed, and unit prices of the three low bidders tabulated.

Section I—Nonconnah Basin Sewers

LIST OF BIDDERS: (May 11 opening; all bids rejected.)

1. Samuel Kraus, St. Louis, Mo. (low bidder)	$306,317
2. Drainage Contractors, Inc., Detroit, Mich	332,672
3. V. P. Loftis Co., Charlotte, N. C	334,748
4. Michael Pontarelli & Sons, Chicago, Ill	361,386
5. Bass Engr. & Constr. Co., and Nolan Constr. Co., Birmingham, Mich.	373,887
6. Forcum-James Co., Memphis, Tenn	394,442
7. Gardner Constr. Co., Nashville, Tenn	412,142
8. W. L. Hailey & Co., Nashville, Tenn	414,786
9. R. H. Wright & Son., Columbus, Ga	635,399

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Outfall structure, complete	1 ea.	$20,222.00	$11,000.00	$14,181.99
2. Extra length piling	10 l. f.	5.00	2.00	3.78
3. 48-in. conc. sewer pipe, 8–10 ft. deep	100 l. f.	12.03	14.40	10.35
4. As above, 10 to 12-ft. deep	584 l. f.	12.78	15.00	11.23
5. As above, 12 to 14-ft. deep	600 l. f.	13.68	16.70	12.29
6. 48-in. conc. culv. pipe, 14 to 16-ft.	100 l. f.	15.19	19.50	13.90
7. As above, 16 to 18-ft. deep	1,570 l. f.	16.38	20.50	19.40
8. As above, 18 to 20-ft. deep	3,093 l. f.	17.73	21.50	20.69
9. As above, 20 to 22-ft. deep	2,100 l. f.	19.18	22.50	28.05
10. As above, 22 to 24-ft. deep	400 l. f.	20.83	25.00	32.59
11. As above, 24 to 26-ft. deep	200 l. f.	22.63	26.20	37.11
12. As above, 26 to 28-ft. deep	100 l. f.	24.53	27.50	43.39
13. As above, 28 to 30-ft. deep	300 l. f.	25.58	28.50	49.25
14. 48-in. conc. culv. pipe in tunnel	52 l. f.	107.00	60.00	36.93
15. 42-in. conc. sew. pipe, 0–6-ft. deep	200 l. f.	8.76	11.00	6.79
16. As above, 6 to 8-ft. deep	550 l. f.	9.28	11.50	7.46
17. As above, 8 to 10-ft. deep	400 l. f.	9.85	12.00	8.23
18. As above, 10 to 12-ft. deep	116 l. f.	10.58	12.60	9.14
19. As above, 12 to 14-ft. deep	1,007 l. f.	11.45	14.30	10.10
20. 42-in. conc. culv. pipe, 12–14-ft. deep	21 l. f.	11.70	15.00	10.64
21. 42-in. conc. sew. pipe, 14–16-ft. deep	600 l. f.	12.48	16.00	11.22
22. 42-in. conc. culv. pipe, 16–18-ft. deep	100 l. f.	13.90	17.50	17.23
23. As above, 18 to 20-ft. deep	71 l. f.	15.20	18.50	18.44
24. 42-in. conc. culv. pipe in tunnel	108 l. f.	115.00	70.00	37.22
25. 36-in. conc. sew. pipe, 0–6-ft. deep	185 l. f.	7.75	9.30	5.95
26. 36-in. conc. sew. pipe, 6–8-ft. deep	444 l. f.	8.20	9.60	6.53
27. As above, 8 to 10-ft. deep	100 l. f.	8.80	10.00	7.25
28. As above, 10 to 12-ft. deep	89 l. f.	9.75	10.70	8.04
29. 24-in. conc. sew. pipe at relief manhole	6 l. f.	6.00	10.00	8.23
30. Special section curved conduit	25 l. f.	35.00	50.00	22.62
31. Siphon No. 1 (3 manholes), complete	1 ea.	15,452.00	13,000.00	14,608.84
32. Siphon No. 2 (3 manholes), complete	1 ea.	15,610.00	20,000.00	19,290.74
33. Siphon No. 3 (3 manholes), complete	1 ea.	9,210.00	10,000.00	13,316.18
34. Standard 5-ft. dia. manholes	4 ea.	154.50	150.00	103.33
35. Extra depth, 5-ft. manholes	21.9 ver. ft.	21.50	20.00	27.77
36. Standard 6-ft. dia. manholes	10 ea.	185.85	200.00	138.47
37. Extra depth- 6-ft. manholes	150 ver. ft.	36.05	30.00	31.32
38. Special 7-ft. dia. manhole	1 ea.	330.00	450.00	371.09
39. Special 7½-ft. dia. manhole	1 ea.	355.00	500.00	380.39
40. Concrete in masonry (1:2:4)	100 c. y.	25.00	25.00	22.75
41. Remove, replace concrete pavement	27 s. y.	4.00	7.00	3.69
42. Conc. in masonry and fndn. (1:3:6)	60 c. y.	15.00	18.00	26.01
43. Timber foundation for pipe	128 Mbm.	80.00	70.00	67
44. Timber bracing left in place	20 Mbm.	65.00	35.00	62

Section I-A—Nonconnah Basin Sewers

LIST OF BIDDERS: (June 22 opening; awarded)

1. F. D. Harvey, Memphis, Tenn. (contract)	$115,51
2. M. T. Reed Constr. Co., Belzoni, Miss	115,95
3. Drainage Contractors, Inc., Detroit, Mich	124,8
4. W. L. Sharpe Contracting Co., Memphis, Tenn	140,0
5. Samuel Kraus Co., St. Louis, Mo	149,4

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Outfall structure, complete	1 ea.	$6,500.00	$8,990.00	$7,00
2. 48-in. conc. sew. pipe, 10–12-ft. deep	284 l. f.	14.90	14.08	16
3. As above, 12 to 14-ft. deep	552 l. f.	16.30	14.63	17
4. 42-in. conc. sew pipe, 0–6-ft. deep	200 l. f.	9.30	9.30	11
5. As above, 6 to 8-ft. deep	550 l. f.	10.60	9.91	12
6. As above, 8 to 10-ft. deep	400 l. f.	11.90	10.80	12
7. As above, 10 to 12-ft. deep	116 l. f.	13.10	11.58	13
8. As above, 12 to 14-ft. deep	1,007 l. f.	14.30	12.43	15
9. 42-in. conc. culv. pipe, 12–14-ft. deep	21 l. f.	14.80	12.73	16
10. 42-in. conc. sew. pipe, 14–16-ft. deep	600 l. f.	15.60	13.58	17
11. 42-in. conc. culv. pipe, 16–18-ft. deep	100 l. f.	17.20	14.92	19
12. As above, 18 to 20-ft. deep	71 l. f.	18.40	16.14	19
13. 42-in. conc. culv. pipe in tunnel (Nonconnah Yd.)	108 l. f.	36.00	43.33	70
14. 36-in. conc. sew. pipe, 0–6-ft. deep	185 l. f.	7.30	8.00	10
15. As above, 6 to 8-ft. deep	444 l. f.	8.30	8.92	10
16. As above, 8 to 10-ft. deep	100 l. f.	9.30	9.46	10
17. As above, 10 to 12-ft. deep	89 l. f.	10.30	10.10	11
18. 24-in. conc. sew. pipe at relief manhole.	3 l. f.	13.70	5.50	10
19. Special section curved conduit	25 l. f.	60.00	38.50	50
20. Siphon No. 2 (Horn Lake Rd.) complete	1 ea.	20,000.00	24,000.00	22,00
21. Siphon No. 3 (Sta. 119+63) complete	1 ea.	14,850.00	11,300.00	10,00
22. Std. 5-ft. diameter manhole	4 ea.	115.00	160.00	18
23. Extra depth 5-ft. dia. manhole	22 ver. ft.	17.00	20.00	21
24. Standard 6-ft. dia. manhole	1 ea.	120.00	180.00	210
25. Extra depth 6-ft. dia. manhole	11 ver. ft.	28.00	27.00	32
26. Special 7½-ft. manhole, complete	1 ea.	400.00	390.00	500
27. Conc. masonry in structures (1:2:4)	100 c. y.	16.00	20.00	25
28. Remove, replace concrete pavement	27 s. y.	6.00	10.00	7
29. Conc. in masonry struct., fndn. (1:3:6)	60 c. y.	18.00	18.00	20
30. Timber foundation for pipe	45 Mbm.	50.00	80.00	70
31. Timber bracing left in place	20 Mbm.	40.00	60.00	35

Section II—Nonconnah Basin Sewers

LIST OF BIDDERS: (May 11 opening, awarded.)

1. G. M. Ferris, Athens, Tenn. (contract)	$287,77
2. V. P. Loftis Co., Charlotte, N. C	300,33
3. Samuel Kraus, St. Louis, Mo	315,41
4. Smith & Pew Constr. Co., Atlanta, Ga	317,04
5. Drainage Contractors, Inc., Detroit, Mich	344,09
6. M. T. Reed Constr. Co., Belzoni, Miss	362,31
7. Forcum-James Co., Memphis, Tenn	375,08
8. Michael Pontarelli and Sons, Chicago, Ill	398,23
9. Bass Engr. & Constr. Co., and Nolan Constr. Co., Birmingham, Mich.	414,12
10. W. L. Hailey & Co., Nashville, Tenn	456,99
11. Gardner Constr. Co., Nashville, Tenn	463,04
12. R. H. Wright & Son, Columbus, Ga	682,39

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 42-in. conc. sewer pipe, 6–8-ft. deep	200 l. f.	$7.55	$7.46	$9
2. As above, 8 to 10-ft. deep	1,100 l. f.	8.15	8.23	9.5
3. As above, 10 to 12-ft. deep	4,842 l. f.	9.05	9.14	10
4. As above, 12 to 14-ft. deep	8,627 l. f.	10.20	10.10	11
5. As above, 14 to 16-ft. deep	5,084 l. f.	12.00	11.21	12
6. 42-in. conc. culv. pipe, in tunnel (RR)	78 l. f.	40.00	34.92	[illegible]
7. 42-in. conc. culv. pipe, in tunnel (hwy.)	84 l. f.	40.00	34.92	[illegible]
8. 24-in. conc. sew. pipe at relief manhole.	3 l. f.	8.00	8.23	[illegible]
9. Siphon No. 4 complete (3 manholes)	1 ea.	7,100.00	7,664.11	5,170
10. Siphon No. 5 complete (3 manholes)	1 ea.	20,200.00	20,802.96	18,510
11. Siphon No. 6 complete (3 manholes)	1 ea.	9,000.00	11,857.32	7,940
12. Siphon No. 7 complete (3 manholes)	1 ea.	12,900.00	16,133.04	11,065
13. Siphon No. 8 complete (3 manholes)	1 ea.	11,800.00	14,406.77	10,345
14. Standard 5-ft. diam. manholes	26 ea.	125.00	103.33	154
15. Extra depth, 5-ft. diam. manholes	204 ver. f.	18.00	27.77	21
16. Conc. in masonry (1:2:4)	120 c. y.	25.00	22.77	25
17. Conc., masonry and found'n (1:3:6)	20 c. y.	22.00	26.01	15
18. Timber foundation	187 Mbm.	30.00	67.39	80
19. Timber bracing, left in place	10 Mbm.	30.00	82.08	65
20. Bitum. pavmt. removed, relaid	20 s. ys	4.00	3.24	4

Section III—Nonconnah Basin Sewers

LIST OF BIDDERS: (May 11 opening; awarded.)

1. Smith & Pew Constr. Co., Atlanta, Ga. (contract)	$305,533
2. L. O. Brayton & Co., Dyersburg, Tenn	329,846
3. Forcum-James Co., Memphis, Tenn	330,663
4. Drainage Contractors, Inc., Detroit, Mich	340,066
5. V. P. Loftis Co., Charlotte, N. C	353,601
6. M. T. Reed Constr. Co., Belzoni, Miss	363,601
7. Bass Engr. & Constr. Co., and Nolan Constr. Co., Birmingham, Mich.	366,202
8. Michael Pontarelli & Sons, Chicago, Ill	374,553
9. Samuel Kraus Co., St. Louis, Mo	382,576
10. Gardner Constr. Co., Nashville, Tenn	511,553

(*Continued on page* 216)

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SEWERS, MEMPHIS (cont'd)

11. W. L. Hailey Co., Nashville, Tenn	520,358
12. R. H. Wright & Son, Columbus, Ga	661,254

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 36-in. conc. sewer pipe, 8–10-ft. deep	100 l. f.	$7.50	$8.00	$8.25
2. 36-in. conc. sew. pipe, 10–12-ft. deep	10,059 l. f.	7.50	8.65	8.75
3. As above, 12 to 14-ft. deep	792 l. f.	8.50	9.25	9.25
4. As above, 14 to 16-ft. deep	5,501 l. f.	9.00	11.00	10.25
5. 36-in. culv. pipe in tunnel (RR.)	68 l. f.	30.00	40.00	45.00
6. 36-in. culv. pipe in tunnel (hwy.)	170 l. f.	30.00	40.00	45.00
7. 30-in. conc. sew. pipe, 10–12-ft. deep	190 l. f.	6.00	7.60	10.00
8. 24-in. conc. sew. pipe, relief manhole	6 l. f.	8.00	8.50	9.50
9. 18-in. sewer pipe, 10 to 12-ft. deep	50 l. f.	3.50	3.00	4.30
10. As above, 12 to 14-ft. deep	470 l. f.	4.00	3.20	4.90
11. As above, 14 to 16-ft. deep	400 l. f.	5.00	4.00	5.50
12. As above, 16 to 18-ft. deep	150 l. f.	6.00	5.00	6.20
13. 12-in. sewer pipe, 0 to 6-ft. deep	60 l. f.	2.00	1.80	1.75
14. As above, 6 to 8-ft. deep	50 l. f.	2.25	2.00	2.00
15. As above, 8 to 10-ft. deep	1,040 l. f.	2.50	2.20	2.25
16. As above, 10 to 12-ft. deep	4,475 l. f.	3.00	2.50	2.50
17. As above, 12 to 14-ft. deep	1,675 l. f.	3.50	2.70	2.75
18. As above, 14 to 16-ft. deep	775 l. f.	4.00	3.40	3.75
19. As above, 16 to 18-ft. deep	445 l. f.	5.00	4.20	5.00
20. As above, 18 to 20-ft. deep	250 l. f.	6.00	4.50	6.25
21. As above, 20 to 22-ft. deep	700 l. f.	7.00	5.00	8.00
22. 12-in. sew. pipe in tunnel (rdwy.)	120 l. f.	20.00	25.00	25.00
23. 12-in. sew. pipe in tunnel (railroad)	20 l. f.	20.00	25.00	30.00
24. 10-in. sew. pipe, 0 to 6-ft. deep	48 l. f.	1.40	1.70	1.50
25. As above, 6 to 8-ft. deep	480 l. f.	1.90	1.90	1.75
26. As above, 8 to 10-ft. deep	1,050 l. f.	2.25	2.10	2.00
27. As above, 10 to 12-ft. deep	907 l. f.	2.60	2.37	2.25
28. As above, 12 to 14-ft. deep	1,990 l. f.	3.00	2.60	2.50
29. As above, 14 to 16-ft. deep	1,692 l. f.	3.70	3.30	3.50
30. As above, 16 to 18-ft. deep	950 l. f.	5.00	4.10	4.50
31. As above, 18 to 20-ft. deep	700 l. f.	6.00	4.40	6.00
32. 8-in. sewer pipe, 8 to 10-ft. deep	444 l. f.	2.10	2.50	1.90
33. As above, 10 to 12-ft. deep	378 l. f.	2.50	2.75	2.15
34. As above, 12 to 14-ft. deep	300 l. f.	2.90	3.00	2.40
35. As above, 14 to 16-ft. deep	200 l. f.	3.50	3.65	3.40
36. As above, 16 to 18-ft. deep	140 l. f.	4.00	4.50	4.65
37. Siphon No. 9 complete (3 manholes)	1 ea.	7,500.00	8,200.00	8,000.00
38. Siphon No. 10 complete (3 manholes)	1 ea.	12,500.00	10,200.00	8,000.00
39. Siphon No. 11 complete (3 manholes)	1 ea.	8,500.00	9,600.00	7,600.00
40. Siphon No. 12 complete (2 manholes)	1 ea.	2,500.00	1,500.00	3,000.00
41. Siphon No. 13 complete (3 manholes)	1 ea.	11,500.00	13,500.00	10,000.00
42. Standard 5-ft. diameter manholes	23 ea.	120.00	175.00	150.00
43. Extra depth 5-ft. dia. manholes	179 ver. f.	17.50	25.00	20.00
44. Standard 4-ft. diameter manholes	18 ea.	100.00	150.00	140.00
45. Std. 4-ft. manholes (rims by city)	22 ea.	95.00	147.00	130.00
46. Extra depth 4-ft. manholes	271 ver. f.	16.00	20.00	17.00
47. Drop construction, 12-in	5.5 ver. f.	10.00	10.00	18.00
48. Concrete in masonry (1:2:4)	50 c. y.	15.00	30.00	21.00
49. Conc. in masonry and fndn	20 c. y.	14.00	27.50	19.00
50. Timber foundation for pipe	112 Mbm.	50.00	60.00	75.00
51. Timber bracing left in place	316 Mbm.	50.00	60.00	75.00
52. Bituminous pavmt. removed, replaced	3,860 s. y.	3.30	2.50	2.50
53. Bermuda sod	150 s. y.	.50	.50	.30
54. 6-in. sewer pipe, 6 to 10-ft. deep	245 l. f.	1.50	2.00	2.00

INTERCEPTING SEWER, CLEVELAND

OWNER: City of Cleveland, J. C. Wenrick, city engineer.

PROJECT: Reconstruction of Big Creek intercepting sewer from Jennings Road, S.W., to Cuyahoga River in Cleveland, Ohio. Involves clearing site, necessary excavation, construction of circular brick sewer and appurtenances; and retaining wall. Four alternates were allowed as follows: (A) Reconstruction of existing pipe (paved invert) and concrete retaining wall; (B) Reconstruction of existing pipe (paved invert) and metal bin-type retaining wall; (C) New 60-in. metal pipe (lined) and concrete retaining wall; (D) New 60-in. metal pipe (lined) and metal bin-type retaining wall. Contract awarded on basis of Alternate C.

CONDITIONS: Contractor to furnish all materials. Rail, highway and water transportation facilities available. Cleveland wage rates are: skilled labor, $1.55 to $1.875 per hour; and common labor, $1.00 to $1.25.

BIDS: Five bids were received December 2, 1943, ranging from the contract low of $38,563 to $54,990.

LIST OF BIDDERS: (Alternate C, new pipe and concrete wall)

1. Domenic Nero Constr. Co., Cleveland, Ohio (contract)	$38,563
2. National Engr. & Contracting Co., Cleveland, Ohio	38,591
3. National Construction Co., Cleveland, Ohio	41,235
4. D. M. Sylvester & P. DiPaolo Constr. Co., Cleveland, Ohio	56,400
5. Lake City Constr. Co., Cleveland, Ohio	54,990

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing the site	Lump Sum	$1,000.00	$1,200.00	$1,200.00
2. Excavation of site	100 c. y.	5.00	12.00	10.00
3. 6′ 3″ circular brick "E" sewer, squared-out bottom	70 l. f.	55.00	64.00	70.00
4. 4-ft. cir. brick "C" sewer	35 l. f.	35.00	24.00	35.00
5. 4-ft. cir. brick "E" sewer, squared-out bottom	10 l. f.	43.00	40.00	45.00
6. 4-ft. cir. brick "C" sewer, squared-out bottom	35 l. f.	38.00	24.00	40.00
7. Circular "E" brick reducer, squared-out bottom, 6′ 3″ to 5′	6 l. f.	65.00	70.00	70.00
8. Circular "C" brick increaser, 5′ to 6′ 3″	6 l. f.	50.00	60.00	50.00
9. Emergency outlet chamber	1 ea.	1,400.00	1,250.00	1,500.00
10. Drop manhole, complete	1 ea.	800.00	1,150.00	750.00
11. Manhole on 6′ 3″ brick sewer	1 ea.	65.00	125.00	100.00
12. Headwall on 4′ brick sewer, complete, incl. apron	25 c. y.	35.00	25.00	30.00
13. Granulated slag fill, in place	1,400 c. y.	3.00	3.75	4.50
14. Connect 6′ 3″ brick sewer to existing sewer	2 ea.	100.00	50.00	50.00
15. Additional fill	20 c. y.	5.00	3.50	10.00
16. Two conc. piers, complete as specified	14 c. y.	60.00	40.00	70.00
17. Struct. steel reconstruction	4 ton	100.00	100.00	50.00
18. Two headwalls on 6′ 3″ sewer	18 c. y.	45.00	32.00	40.00

Metal Bin-Type Retaining Wall Alternate (no award)

Item	Quan.	Unit Prices (1)	(2)	(3)
19. Metal bin-type retaining wall	300 s. f.	$7.67	$7.00	$12.00
20. Excavation and fill (bin-type)	50 c. y.	3.50	4.00	6.00
21. Additional backfill (bin-type)	70 c. y.	3.50	4.00	10.00

Concrete Retaining Wall Alternate (award)

Item	Quan.	Unit Prices (1)	(2)	(3)
22. Concrete retaining wall	45 c. y.	$40.00	$27.00	$70.00
23. Excavation and fill (conc. wall)	55 c. y.	3.50	5.00	10.00
24. Additional backfill (conc. wall)	20 c. y.	3.50	4.00	10.00
25. Gran. slag backfill (conc. wall)	10 c. y.	3.00	5.00	10.00

Reconstructing Existing Pipe Alternate (no award)

Item	Quan.	Unit Prices (1)	(2)	(3)
26. Reconstruct exist. wr. iron pipe with paved invert (Trestle No. 1)	Lump Sum	$12,850.00	$13,375.00	$13,000.00
27. As above, at Trestle No. 2	Lump Sum	12,912.00	12,750.00	12,500.00

New 60-in. Metal Pipe Alternate (award)

Item	Quan.	Unit Prices (1)	(2)	(3)
28. New 60-in. metal pipe (lined) at Trestle No. 1	142 l. f.	$53.00	$54.00	$44.00
29. New 60-in. metal pipe (lined) at Trestle No. 2	193 l. f.	53.00	49.00	44.00

SEWAGE TREATMENT PLANT, SEWERS HOPKINSVILLE, KY.

OWNER: Kentucky Dept. of Welfare, Frankfort, Ky.

PROJECT: Construction of sewage treatment plant and sanitary sewers at Western State Hospital, Hopkinsville, Ky., 1½ miles east of the city on U. S. Highway No. 68.

CONDITIONS: Contractor to furnish all materials and complete work in 180 calendar days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.15 $1.50 per hour; semi-skilled, 50 to 60c.; and common, 45c.

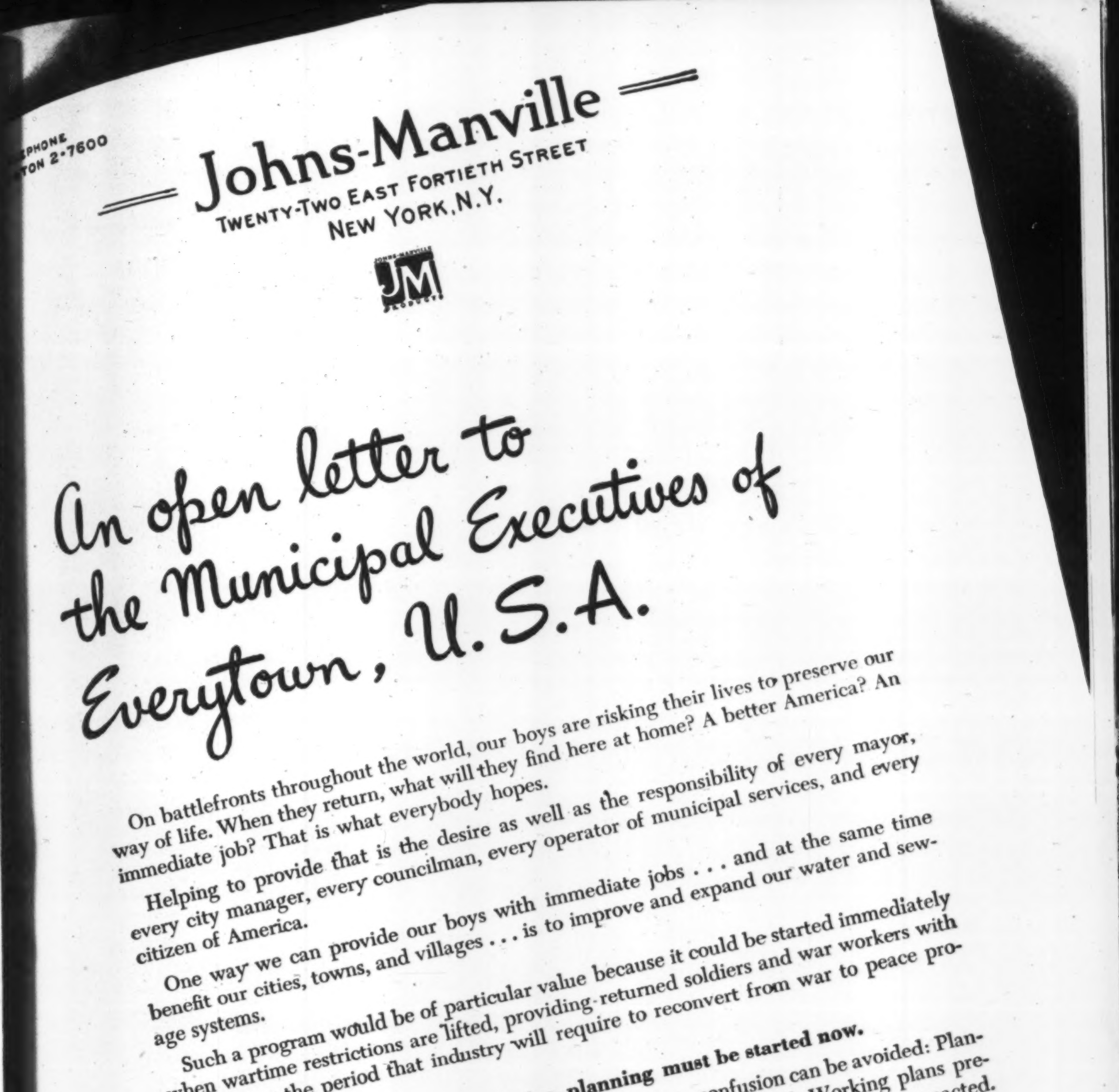
BIDS: Three bids were received August 3, 1943, ranging from the contract low of $76,160 to $102,488.

LIST OF BIDDERS:

1. E. H. Marhoefer, Jr., Co., Chicago, Ill. (contract)	$76,16
2. Coleman, Trainer & Co., Huntington, W. Va	83,76
3. W. L. Hailey & Co., Nashville, Tenn	102,48

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Sewage treatment plant	Lump Sum	$52,525.00	$62,588.40	$70,000
2. 12-in. cast iron pipe	162 l. f.	5.00	3.00	5.0
3. 21-in. reinforced concrete pipe	50 l. f.	3.00	3.50	3.0
4. 2-in. cast iron pipe	600 l. f.	.70	.90	1.0
5. 12-in vitrified clay pipe	4,195 l. f.	1.20	.85	1.5

(Continued on page 220)



TELEPHONE
…TON 2-7600

Johns-Manville
TWENTY-TWO EAST FORTIETH STREET
NEW YORK, N.Y.

JM

An open letter to the Municipal Executives of Everytown, U.S.A.

On battlefronts throughout the world, our boys are risking their lives to preserve our way of life. When they return, what will they find here at home? A better America? An immediate job? That is what everybody hopes.

Helping to provide that is the desire as well as the responsibility of every mayor, every city manager, every councilman, every operator of municipal services, and every citizen of America.

One way we can provide our boys with immediate jobs . . . and at the same time benefit our cities, towns, and villages . . . is to improve and expand our water and sewage systems.

Such a program would be of particular value because it could be started immediately when wartime restrictions are lifted, providing returned soldiers and war workers with jobs during the period that industry will require to reconvert from war to peace production.

But if this program is to be effective, planning must be started now.

Time may be shorter than we think. By starting now, confusion can be avoided: Planning can be constructive, efficient. Local needs can be analyzed. Working plans prepared. Specifications and contract documents drawn up. Enabling legislation enacted. Financing arranged. Rights of way purchased. Everything put in order, ready to go when the boys come home again.

As an aid to municipalities in planning permanent public improvements of benefit to every member of the community, the Committee on Water and Sewage Works Development has prepared a booklet entitled "Blueprint Now." In case you have not received a copy, we are sure they will be glad to send you one. The Committee may be addressed at Suite 2110, 500 Fifth Avenue, New York 18, New York.

JOHNS-MANVILLE

This booklet can help you start planning now.

SEWAGE PLANT, KY. (cont'd)

6. 10-in vitrified clay pipe	1,336 l. f.	1.00	.75	1.25
7. 8-in. vitrified clay pipe	2,300 l. f.	.85	.60	1.00
8. 6-in. vitrified clay pipe	200 l. f.	.70	.50	.90
9. 12-in. vitr. clay fittings	6 ea.	4.00	2.50	4.00
10. 10-in. vitr. clay fittings	10 ea.	3.50	2.25	3.00
11. 8-in. vitr. clay fittings	15 ea.	2.50	1.75	2.50
12. 6-in. vitr. clay fittings	10 ea.	2.00	1.25	2.50
13. Vitrified clay stoppers	25 ea.	1.00	.20	.50
14. Trench, 0 to 4-ft. deep	4,320 l. f.	.50	.55	1.00
15. Trench, 4 to 6-ft. deep	3,593 l. f.	.60	.70	1.25
16. Earth fill	188 c. y.	1.00	.60	2.00
17. Masonry foundation	68 c. y.	15.00	7.00	30.00
18. Manholes, 2 to 4-ft	16 ea.	60.00	50.00	100.00
19. Manholes, 4 to 6-ft	17 ea.	90.00	70.00	125.00
20. Manholes, 6 to 8-ft	1 ea.	110.00	85.00	150.00
21. Extra depth for manholes	1 ea.	25.00	15.00	25.00
22. Concrete walks	50 l. f.	1.20	1.25	2.00
23. Tunnel under walks	44 l. f.	3.00	2.00	8.00
24. Tunnel under highway	30 l. f.	10.00	5.00	10.00
25. Crushed rock, for roads	55 ton	3.00	2.00	3.00
26. Stone chips, for trench	100 ton	2.50	2.00	2.50
27. Concrete piers	1 c. y.	60.00	40.00	40.00
28. Highway paving	25 l. f.	2.00	.85	4.00
29. Cast iron fittings	20 lb.	.15	.15	.10
30. Rock excavation	560 c. y.	8.00	10.00	7.00

SANITARY SEWER, UTAH

OWNER: Town of Clearfield, Utah; G. H. Holt, president of Town Board; Caldwell & Richards, Salt Lake City, engineers.

PROJECT: Construction of sanitary sewer system in Clearfield, Utah, including the furnishing and laying of 50,300 linear feet of vitrified clay sewer pipe ranging from 6 to 12-in. in diameter; excavation and backfill for main trench and for house connections; manholes, flush tanks, and lamp holes; enclosing cast iron pipe in 20-in. steel casing for passage under railroad tracks; and necessary paving. Alternates were allowed for clay or concrete sewer pipe. Contract awarded on basis of clay pipe.

CONDITIONS: Contractor to furnish all materials and complete work in 150 days. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.25 to $1.50 per hour; semi-skilled, $1.12½; and common, 75c.

BIDS: Bids were originally asked September 7, 1943, but opening was postponed to Oct. 28, 1943. Four bids were received on this date, ranging from the contract low of $144,179 to $175,041. Estimated construction cost, $161,201.

LIST OF BIDDERS:

1. Peter Kiewit Sons Co. and Big Horn Constr. Co., Denver, Colo. (contract)	$144,179
2. Roarks & Co., Ogden, Utah	159,833
3. Stroud-Seabrook, Bakersfield, Calif	169,315
4. C. O. & W. J. Brand, Riverside, Calif	175,041

Schedule I—Excavation and Backfill

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excav. and backfill, main trench	28,500 c. y.	$1.20	$2.02	$2.30
2. Excav. and backfill, house conn	10,000 c. y.	1.37	1.72	3.00

Schedule II—Clay Pipe and Fittings

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 12-in. clay pipe and fittings	2,300 l. f.	$1.50	$1.20	$1.00
2. 10-in. clay pipe and fittings	4,500 l. f.	1.20	1.06	.90
3. 8-in. clay pipe and fittings	18,500 l. f.	.95	.92	.70
4. 6-in. clay pipe and fittings	25,000 l. f.	.75	.80	.50
5. 4-in. clay pipe and fittings (service connections)	20,000 l. f.	.75	.63	.30
6. 12x4-in. clay pipe wyes	12 ea.	6.00	3.41	5.00
7. 10x4-in. clay pipe wyes	19 ea.	4.80	2.64	4.50
8. 8x4-in. clay pipe wyes	142 ea.	3.65	2.62	3.00
9. 6x4-in. clay pipe wyes	567 ea.	2.65	1.67	2.00

Schedule III—Concrete Pipe and Fittings (Alternate items allowed)

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 12-in. conc. pipe and fittings	2,300 l. f.	$1.50	$1.22	$1.00
2. 10-in. conc. pipe and fittings	4,500 l. f.	1.25	1.08	.90
3. 8-in. conc. pipe and fittings	18,500 l. f	1.00	.94	.70
4. 6-in. conc. pipe and fittings	25,000 l. f.	.80	.82	.50
5. 4-in. conc. pipe and fittings (service connections)	20,000 l. f.	.75	.65	
6. 12x4-in. conc. pipe wyes	12 ea.	6.00	3.61	5.
7. 10x4-in. conc. pipe wyes	19 ea.	5.00	2.84	4.
8. 8x4-in. conc. pipe wyes	142 ea.	4.50	2.82	3.
9. 6x4-in. conc. pipe wyes	567 l. f.	4.00	1.77	2.

Schedule IV—Manholes, Flush Tanks, Lamp Holes

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Manholes, 4 to 6-ft. deep	14 ea.	$92.00	$94.00	$100.
2. Manholes, 6 to 8-ft. deep	73 ea.	110.00	107.00	120.
3. Manholes, 8 to 10-ft. deep	32 ea.	132.00	118.00	140.
4. Manholes, 10 to 12-ft. deep	9 ea.	167.00	127.00	160.
5. Flush tanks, 4 to 6-ft. deep	1 ea.	138.00	132.00	160.
6. Flush tanks, 6 to 8-ft. deep	1 ea.	167.00	145.00	180.
7. Flush tanks, 8 to 10-ft. deep	1 ea.	196.00	156.00	200.
8. Lamp holes, 8-in. line type B	1 ea.	12.00	22.00	30.
9. Lamp holes, 6-in. line type B	17 ea.	16.00	19.50	27.

Schedule V—Miscellaneous

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 10-in. c. i. pipe in 20-in. steel casing under U. P. tracks	90 l. f.	$16.00	$14.00	$20.
2. 6-in. c. i. pipe in 20-in. steel casing under U. P. tracks	75 l. f.	15.00	14.00	19.
3. Furn. and place fill mat'ls. under pipe	1,000 c. y.	7.00	2.50	6.
4. Furn., place lumber under pipe	5 Mbm.	100.00	70.00	150.
5. Furn., place lumber as sheeting in place	5 Mbm.	100.00	90.00	125.
6. Furn., place road gravel base	1,000 c. y.	3.30	2.00	3.
7. Furn., place bitum. road surface	1,800 s. y.	1.50	1.60	1.
8. Furn., place conc. road slab	30 c. y.	23.00	28.00	25.
9. Furn., field office complete	Lump Sum	460.00	400.00	1,000.

TUNNEL SEWER, FORT WORTH, TEXAS

OWNER: City of Fort Worth, Tex., S. H. Bothwell, city ma ager; Freese & Nichols, engineers.

PROJECT: Construction of 48-in. tunnel sewer in Fort Worth, Tex., including shale and rock excavation in tunnel; concret tunnel lining; shaft lining; precast concrete pipe in trenche from 6 to 26-ft. deep; monolithic concrete pipe in trenches to 26-ft. deep; junction with existing 54-in. sewer; and co nection to existing box at west end of project.

CONDITIONS: Contractor to furnish all materials and com plete work in 120 days. Rail and highway transportation faci ities available. Wage rates specified are: skilled labor, $1.5 per hour; semi-skilled, 75c.; and common, 50c. Maxim depth of tunnel approximates 80 ft.

LIST OF BIDDERS: (Bids March 23, 1943.)

1. O. J. Parrot, Dallas, Tex. (contract)
2. J. G. Bartholomew, Dallas, Tex.
3. Williams & Whittle, Inc., Dallas, Tex.
4. Ben Sira & Co., Dallas, Tex.
5. W. E. Callahan Constr. Co., Dallas, Tex.

Item	Quan.	Unit Prices (1)	(2)
1. Shale excavation in tunnel	2,750 c. y.	$13.00	$26.25
2. Rock excavation in tunnel	1,200 c. y.	15.00	29.75
3. Concrete lining in tunnel	1,760 c. y.	27.00	29.50
4. Shaft lining	185 ver. f.	40.00	32.00
5. Precast conc. pipe — 6 to 8-ft. trench	50 l. f.	7.20	10.80
6. Precast conc. pipe — 8 to 10-ft. trench	800 l. f.	8.10	11.60
7. Precast conc. pipe — 10 to 12-ft. trench	300 l. f.	9.00	12.60
8. Precast conc. pipe — 12 to 14-ft. trench	80 l. f.	11.00	14.70
9. Precast conc. pipe — 14 to 16-ft. trench	40 l. f.	13.50	16.25
10. Precast conc. pipe — 16 to 18-ft. trench	40 l.f.	16.00	17.50
11. Precast conc. pipe — 18 to 20-ft. trench	30 l. f.	20.00	18.90
12. Precast conc. pipe — 20 to 22-ft. trench	20 l. f.	24.00	20.50
13. Precast conc. pipe — 22 to 24-ft. trench	15 l. f.	29.00	22.60
14. Precast conc. pipe — 24 to 26-ft. trench	10 l. f	36.00	24.40
15. Monolithic conc. pipe, 6 to 8-ft. trench	10 l. f.	14.00	15.70
16. Monolithic conc. pipe, 8 to 10-ft. trench	50 l. f.	15.00	16.80
17. Monolithic conc. pipe, 10 to 12-ft. trench	10 l. f.	16.00	18.00
18. Monolithic conc. pipe, 12 to 14-ft. trench	10 l. f.	18.00	19.00
19. Monolithic conc. pipe, 14 to 16-ft. trench	10 l. f.	20.00	20.50
20. Monolithic conc. pipe, 16 to 18-ft. trench	10 l. f.	22.00	22.00
21. Monolithic conc. pipe, 18 to 20-ft. trench	10 l. f.	25.00	23.70
22. Monolithic conc. pipe, 20 to 22-ft. trench	10 l. f.	30.00	25.50
23. Monolithic conc. pipe, 22 to 24-ft. trench	5 l. f.	35.00	27.00
24. Monolithic conc. pipe, 24 to 26-ft. trench	5 l. f.	40.00	30.00
25. Std. 4-ft. manholes, 6 ft. deep	1 ea.	150.00	200.00
26. Add'l standard manhole feet	6 ver. f.	10.00	14.00
27. Junction chamber on exist. 54-in. sewer	Lump Sum	250.00	1,050.00
28. Conn. to exist box at West End	Lump Sum	100.00	200.00
29. 1:14 concrete cradle in place	350 c. y.	13.00	9.50
30. Sheeting left in place, open cut sewer	15 M bm.	20.00	100.00

DU PONT
REG. U.S. PAT. OFF.

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DU PONT EXPLOSIVES

Blasting Supplies and Accessories

SEWERAGE SYSTEM, MORGANFIELD, KY.

OWNER: Federal Works Agency, Chicago, Ill. E. L. Fisher, project engineer.

PROJECT: Sewerage system in Morganfield, Ky., involving construction of sanitary sewers (Section I), and sewage pumping station and sewage treatment plant (Section II). Sanitary sewer section requires trenching ranging from 0 to 24-ft. deep; laying of clay or concrete sewer pipe; cast iron pipe; standard manholes; removal and relaying of pavement; and concrete in piers and pipe cradles. Section II consists of construction of uptown sewage pumping station; sewage treatment plant; and water supply line for the plant.

CONDITIONS: Contractor to furnish all materials and complete work in 120 consecutive calendar days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, 90c. to $1.625 per hr.; semi-skilled, 75c. to $1.25; and common, 70c. per hour.

BIDS: Six bids were received on each section of the project on July 2, 1943. Range of bids on Section I was from the contract low of $79,526 to $127,391; and on Section II, from the contract low of $73,568 to $92,330.

LIST OF BIDDERS:

1. D. L. Amici Co., Forest Park, Ill. (contract)	$79,526
2. Michael Pontarelli & Sons, Chicago, Ill	84,121
3. Birmingham Constr. Co., Birmingham, Mich	94,115

Section I—Sanitary Sewers

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Trenching, 0 to 6-ft. deep	20,563 l. f.	$1.00	$0.55	$1.10
2. Trenching, 6 to 8-ft. deep	8,429 l. f.	1.10	.66	1.25
3. Trenching, 8 to 10-ft. deep	2,688 l. f.	1.30	.83	1.45
4. Trenching, 10 to 12-ft. deep	1,560 l. f.	1.50	1.04	1.50
5. Trenching, 12 to 14-ft. deep	723 l. f.	2.00	1.32	1.95
6. Trenching, 14 to 16-ft. deep	689 l. f.	2.50	1.87	3.25
7. Trenching, 16 to 18-ft. deep	693 l. f.	3.25	3.08	4.25
8. Trenching, 18 to 20-ft. deep	233 l. f.	4.00	4.18	7.70
9. Trenching, 20 to 22-ft. deep	254 l. f.	4.50	5.83	8.40
10. Trenching, 22 to 24-ft. deep	199 l. f.	5.00	8.03	9.45
11. 12-in. clay or conc. sewer pipe	1,979 l. f.	.70	1.26	.80
12. 10-in. clay or conc. sewer pipe	4,923 l. f.	.55	1.10	.70
13. 8-in. clay or conc. sewer pipe	29,047 l. f.	.45	.90	.52
14. Wye branch, 6" on 12" pipe	4 ea.	1.35	3.30	2.10
15. Wye branch, 6" on 12" pipe	29 ea.	1.10	2.75	1.62
16. Wye branch, 6" on 12" pipe	375 ea.	.90	2.20	1.05
17. 12-in. c. i. pipe laid in sewer	60 l. f.	4.00	5.00	2.90
18. 10-in. c. i. pipe, laid in sewer	12 l. f.	3.50	4.00	2.50
19. 8-in. c. i. pipe, laid in sewer	52 l. f.	2.40	3.00	2.20
20. Standard sewer manholes, 6-ft. deep	134 ea.	85.00	100.00	100.00
21. Addition vertical manhole depth	212 ver. f.	10.00	15.00	20.00
22. Take up and relay pavement (black-top)	1,028 s. y.	3.00	2.00	3.00
23. As above; brick pavmt., conc. base	54 s. y.	4.00	4.00	3.50
24. As above; conc. pavmt., 6-in. thick	105 s. y.	4.00	4.00	3.00
25. Class B conc. in piers, incl. forms, bolts and pipe clamps	3 c. y.	30.00	40.00	30.00
26. Class C conc. in pipe encasement and cradles	5 c. y.	20.00	20.00	20.00

Section II—Sewage Pumping Station and Treatment Plant

LIST OF BIDDERS:

1. Buesching Bros. Constr. Co., Fort Wayne, Ind. (contract)	$73,568
2. A. C. Rehm, Oak Park, Ill	77,811
3. Birmingham Constr. Co., Birmingham, Mich	83,641

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation (pumping station)	500 c. y.	$6.63	$3.00	$3.00
2. Sewage pumping station	Lump Sum	8,214.00	10,000.00	9,940.00
3. 4-in. c. i. pipe force main (incl. trenching)	1,176 l. f.	1.60	1.50	1.55
4. Excavation (sewage treat. plant)	2,150 c. y.	2.10	1.60	2.20
5. Screen and grit removing strainer	Lump Sum	881.00	1,000.00	1,645.00
6. Sewage pumping station	Lump Sum	14,337.00	15,500.00	12,820.00
7. Imhoff tank and appurtenances	Lump Sum	9,266.00	14,500.00	15,270.00
8. Trickling filter	Lump Sum	19,737.00	18,000.00	21,130.00
9. Final settling tank	Lump Sum	4,645.00	6,000.00	7,715.00
10. Sludge drying beds (one group)	Lump Sum	2,158.00	2,000.00	2,815.00
11. Trench excavation	350 c. y.	2.22	2.00	1.50
12. 12-in. cast iron pipe	40 l. f.	5.90	4.00	3.25
13. 6-in. cast iron pipe	200 l. f.	2.60	3.00	1.75
14. 2-in. galv. wrt. steel pipe	350 l. f.	.55	.50	1.20
15. 1¼-in. galv. wrt. steel pipe	50 l. f.	.42	.40	1.20
16. 1-in. galv. wrt. steel pipe	10 l. f.	.30	.30	1.00
17. 12-in. sewer pipe	670 l. f.	1.73	1.50	.80
18. 6-in. sewer pipe	170 l. f.	.70	1.00	.50
19. 4-in. sewer pipe	25 l. f.	.56	.50	.30
20. Class B concrete	12 c. y.	27.00	18.00	40.00
21. 1¼-in. yard hydrants	2 ea.	47.00	40.00	40.00
22. 1¼-in. gate valves and valve boxes	1 ea.	24.00	15.00	15.00
23. Standard manholes (complete)	2 ea.	151.00	100.00	100.00
24. 2-in. galv. wrt. steel pipe for plant water supply line	1,000 l. f.	.78	.70	1.25
25. Connection to existing mains, etc.	Lump Sum	53.00	50.00	100.00

STORM WATER SEWER WASHINGTON, D. C.

OWNER: District Commissioners, Dept. of Sanitary Engineering, Washington, D. C.

PROJECT: Construction of South Capitol St. storm water sewer between Anacostia River at Poplar Point and Portland St., in Washington, D. C. Almost 3,400 ft. of reinforced concrete pipe sewer to be laid; sizes are 7½-ft., 6½-ft. and a twin 5-ft. pipe, and in addition a 6½-ft. diameter culvert pipe sewer. Bracing of the sewer trench is required to protect against land movements noticeable in previously laid sewers in this section. Contractor is also required to dispose of unsuitable fill material at points specified by the District Engineer.

CONDITIONS: Contractor to furnish all materials and complete work in 260 calendar days. Rail, highway and water transportation facilities available. Wage rates are: skilled labor, $1.50 to $2.00 per hour; semi-skilled, 75c. to $1.25; and common labor, 75c.

BIDS: The three low bids, opened June 10, 1943, range from the contract low of $419,081 to $459,209. Award made June 25 to low bidder.

LOW BIDDERS:

1. National Structures Corp., New York, N. Y. (contract)	$419,081
2. Leo Butler Co., Silver Springs, Md	458,996
3. Drainage Contractors, Inc., Detroit, Mich	459,209

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation (all types)	31,220 c. y.	$1.70	$3.00	$3.00
2. Concrete masonry "CC"	3,020 c. y.	30.00	20.60	28.00
3. Sewer brick masonry	30 c. y.	40.00	45.00	50.00
4. Rein. conc. pipe sewer, 7½-ft. dia.	2,040 l. f.	45.00	37.10	39.00
5. Rein. conc. pipe sewer, 6½-ft. dia.	810 l. f.	40.00	33.50	36.00
6. Rein. conc. culv. pipe sewer, 6½-ft. dia.	400 l. f.	70.00	54.00	50.00
7. Twin 5-ft. dia. rein. conc. pipe sewer	195 l. f.	60.00	38.80	40.00
8. 24-in. concrete pipe sewer	885 l. f.	4.00	4.95	4.2
9. 21-in. concrete pipe sewer	330 l. f.	3.00	4.40	3.50
10. 18-in. concrete pipe sewer	360 l. f.	2.70	3.40	3.00
11. Untr. timber bearing piles	162,350 l. f.	.50	.80	.6
12. Sewer trench bracing	133 l. f.	40.00	83.80	125.00
13. Gravel, sewer subgrade	1,390 ton	4.00	3.30	5.00
14. Terra cotta pipe underdrain, 6-in.	12,575 l. f.	.40	.40	.15
15. Bracing lumbers	173 M bm.	20.00	50.00	35.00
16. Rubble stone masonry	2 c. y.	60.00	150.00	150.00
17. Concrete masonry	50 c. y.	30.00	22.00	20.00
18. Borrow excavation	1,200 c. y.	1.00	1.00	1.00
19. Dispose of unsuitable fill matl.	1,200 c. y.	1.00	.50	.50
20. Overhaul (quarter-mile)	2,400 c. y.	.10	.10	.05

CHANNEL PROTECTION, OHIO

OWNER: Ohio State Dept. of Highways, Columbus.

PROJECT: Channel protection on Section Mansfield along State Highway No. 501, U. S. Highway 30-N, Richland County, Ohio. Project involves channel excavation, riprapping, sewers and underdrains, topsoiling, flowline paving and seeding and sodding for roadway areas; and cofferdams and pumping, wet and dry structure excavation, concrete for walls, slab and footings, waterproofing, and other apurtenant work in connection with construction of erosion-control dam.

CONDITIONS: Contractor to furnish all materials. No completion date specified. Rail and highway transportation facilities available. Wage rates are: skilled labor, $1.15 to $1.75 per hour; semi-skilled, 82½c. to $1.25; and common, 82½c.

(Continued on page 226)

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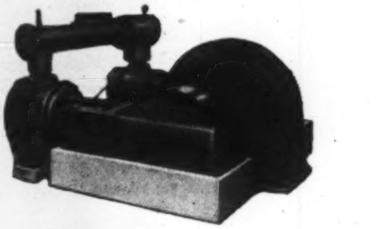

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s are available in vertical and horizontal
signs for steam, belt and electric motor
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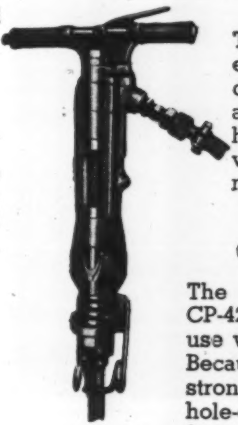

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CHANNEL PROTECTION, OHIO (cont'd)

BIDS: Two bids were received December 14, 1943, the contract low of $31,136, and $35,406. Estimate, $32,200.

LIST OF BIDDERS:

1. Purdy Constr. Co., Mansfield, Ohio (contract)	$31,136
2. Pierce Constr. Co., Toledo, Ohio	35,406

Item	Quan.	Unit Prices (1)	(2)	(3)*
1. Channel excavation	2,939 c. y.	$2.25	$1.25	$1.25
2. 18-in. type B riprap	1,600 s. y.	3.75	9.00	8.00
3. 18-in. grout filled, type B riprap	30 s. y.	3.75	10.00	8.50
4. 18-in. pl. cem. conc. pipe for storm sewer	72 l. f.	3.25	3.00	2.60
5. Topsoil, 2-in. thick	90 s. y.	.45	.60	.12
6. 6-in. pl. cem. conc. pipe for underdrain	12 l. f.	1.25	1.00	1.20
7. Flowline paving	Lump Sum	800.00	4,500.00	300.00
8. Seeding and protecting rdway areas	6,065 s. y.	.08	.10	.07
9. Commercial fertilizer (4–12–4)	1,092 lb.	.035	.06	.05
10. Cofferdams and pumping	Lump Sum	4,500.00	500.00	5,000.00
11. Wet excavation, structures	290 c. y.	4.00	3.00	3.50
12. Dry excavation, structures	50 c. y.	4.00	2.50	2.75
13. Class E conc., walls and slab	160 c. y.	40.00	35.00	30.00
14. Class E conc., footings	87 c. y.	30.00	25.00	20.00
15. Type B waterproofing	22 s. y.	2.50	2.50	2.25
16. Reinforcing steel	11,734 lb.	.08	.08	.07
17. Struct. contraction joint	29 l. f.	1.00	5.00	2.00
18. Porous backfill	75 c. y.	2.50	4.00	3.00
19. Sodding slopes	90 s. y.	.90	.50	.55
20. Erecting and maintaining lights, signs, barricades and watchmen	Lump Sum	....	300.00	50.00
21. Premium on industrial insurance	Lump Sum	637.00	525.00	533.82

* *Engineer's estimate.*

RAIL REMOVAL, STREET REPAIR SAN FRANCISCO, CALIF.

OWNER: San Francisco Dept. of Public Works, John J. Casey, city engineer.

PROJECT: Rail salvage and street pavement repair in connection with trolley rail removal along Guerrero Street between 14th Street and San Jose Avenue in San Francisco, Calif. Involves removal of 42,236-ft. of single track from various types of pavement and repaving necessary trenches and roadway widths resulting from rail removal.

CONDITIONS: Contractor to furnish all materials and complete work in 150 days. Highway transportation facilities available along site of work. Minimum wage rates are: skilled labor, $1.21¼ per hour; semi-skilled, $1.06¼; and common, 95c.

BIDS: Three bids were received November 24, 1943, ranging from the low of $113,225 to $180,278.

LIST OF BIDDERS:

1. Eaton & Smith, San Francisco, Calif. (low bid)	$113,225
2. M. J. Lynch, San Francisco, Calif	145,402
3. A. D. Schader, San Francisco, Calif	180,278

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove track from asph. conc. paved street with no existing rail headers; constr. an asph. on conc. pavmt. 4-sack Cl. E conc. base and 2-in. asph. conc. wearing surf. in rail trenches	5,519 track ft.	$1.89	$1.70	$3.15
2. Remove track from street paved with asph. conc. wearing surf. with exist. basalt block rail headers; remove rail headers; constr. asph. on conc. pavement, as above	13,389 track ft.	1.89	2.33	3.15
3. Remove track from street paved with asph. conc. wearing surf., with or without basalt rail headers; constr. 4-sack Cl. E conc. base for full depth of rail trenches and flush with exist. pavmt. surf	16,775 track ft.	1.89	2.09	2.75
4. Remove track from street paved with basalt block pavmt.; constr. 4-sack Cl. E conc. base as in Item 3	460 track ft.	1.99	2.52	2.75
5. Remove track; remove pavmt., full width; remove ties; constr. fill; and constr. asph. on conc. pavmt. consisting of 6-in. 5-sack Cl. E conc. base and 2-in. asph. conc. wear. surf. for full width of trk. area	3,833 track ft.	4.29	5.80	7.35
6. Remove track, slot rails, inspection boxes, etc.; remove pavmt. and planking; cut down cable trough and fill same; constr. 6-in. 5-sack Cl. E conc. base and 2-in. asph. conc. wear. surf. full width of track area	1,320 track ft.	6.09	7.06	10.65
7. Remove track from street paved with vitr. brick on conc. base; basalt blocks on conc. base; or basalt blocks on sand; and constr. brick pavmt. on conc. base	1,100 track ft.	3.59	6.39	5.45
8. Remove track; remove basalt block pavmt. full width; remove ties; constr. 6-in. 5-sack Cl. E conc. pavmt. full width of track area	200 track ft.	4.09	5.51	
9. Asphaltic concrete binder	1,100 ton	4.00	7.95	
10. Asph. concrete wearing surface	2,200 ton	4.50	7.95	
11. Remove and replace asph. conc. wearing surface where directed	20,000 s. f.	.10	.165	

TIMBER AND STEEL GROINS DELAWARE

OWNER: Delaware State Highway Department, Dover.

PROJECT: Construction of identical timber and ste groins at Rehoboth Beach and at Bethany Beach, Del., protect roadway, shore and beach areas against wave actio

CONDITIONS: Contractor to furnish all materials an complete projects by June 1, 1944. Rail, highway and wat transportation facilities available at Rehoboth Beach, an highway and water transportation available at Bethany Beac Prevailing wage rates to be paid.

BIDS: Three bids were received on each project Decemb 1, 1943, and in each case they ranged from $10,701 to $19,45

Rehoboth Beach Groins

LIST OF BIDDERS:

1. George E. Shockley, Rehoboth Beach, Del. (contract)	$10,7
2. Arnold M. Diamond, Brooklyn, N. Y.	17,2
3. Eisenberg Constr. Co., Camden, N. J.	19,

Item	Quan.	Unit Prices (1)	(2)
1. Creosoted timber piles	2,290 l. f.	$1.90	$2.50
2. Creosoted timber wales	5.4 M bm.	200.00	300.00
3. Creosoted sheet piles	1.5 M bm.	180.00	300.00
4. Steel sheet piles	50 ton	100.00	190.00

Bethany Beach Groins

LIST OF BIDDERS:

1. George E. Shockley, Rehoboth Beach, Del. (contract)	$10,7
2. Arnold M. Diamond, Brooklyn, N. Y.	17,2
3. Eisenberg Constr. Co., Camden, N. J.	19,

Item	Quan.	Unit Prices (1)	(2)
1. Creosoted timber piles	2,290 l. f.	$1.90	$2.50
2. Creosoted timber wales	5.4 M bm.	200.00	300.00
3. Creosoted sheet piles	1.5 M bm.	180.00	300.00
4. Steel sheet piles	50 ton	100.00	190.00

BULKHEAD, SEATTLE, WASH.

OWNER: City of Seattle, Washington; C. L. Wartelle, c engineer.

PROJECT: Construction of riprap bulkhead along Seav Ave., Seattle, fronting on Shilshole Bay. Project involves f nishing and placing 8,300 cubic yards of rock riprap.

CONDITIONS: Contractor to furnish all material, and h from nearby dock to site of work. Completion time 120 da Wage rates are: skilled labor, $2.00 per hr.; semi-skille $1.50; and common, $1.10.

BIDS: Three bids were received May 13, 1943, ranging fr the contract low of $31,955 to $89,806.

LIST OF BIDDERS:

1. General Construction Co., Seattle, Wash. (contract)	$31,9
2. L. Romano Engineering Corp., Seattle, Wash	40,2
3. Puget Sound Bridge & Dredging Co., Seattle, Wash	89,8

Item	Quan.	Unit Prices (1)	(2)
1. Rock riprap	8,300 c. y.	$3.85	$4.85

NEWS OF THE WEEK

(Continued from p. 73)

ngineer review board
o speed Chicago plans

an aid to more efficient planning
acetime public-works construction,
City of Chicago recently established
ngineering Board of Review to pass
e merits of all major engineering
cts before they are approved for
ruction.

nouncement of the engineers se-
d to serve on the board and a de-
outline of the board's functions
made by Mayor Edward J. Kelly
e April 6 meeting of the Western
ty of Engineers.

Board members

lip Harrington, commissioner of
ays and superhighways, is chair-
of the board and Lloyd M. Johnson,
missioner of streets and electricity,
e-chairman. Other members in-
: Oscar E. Hewitt, commissioner of
c works; Paul Gerhardt, Jr., build-
commissioner; Ralph H. Burke,
tive director of the Postwar Eco-
c Advisory Council and chief en-
r of the Chicago Park District; and
H. Trinkaus, chief engineer of the
ary District. Peter F. Girard, for-
assistant chief engineer of the
rtment of Subways and Superhigh-
is projects engineer for the board.

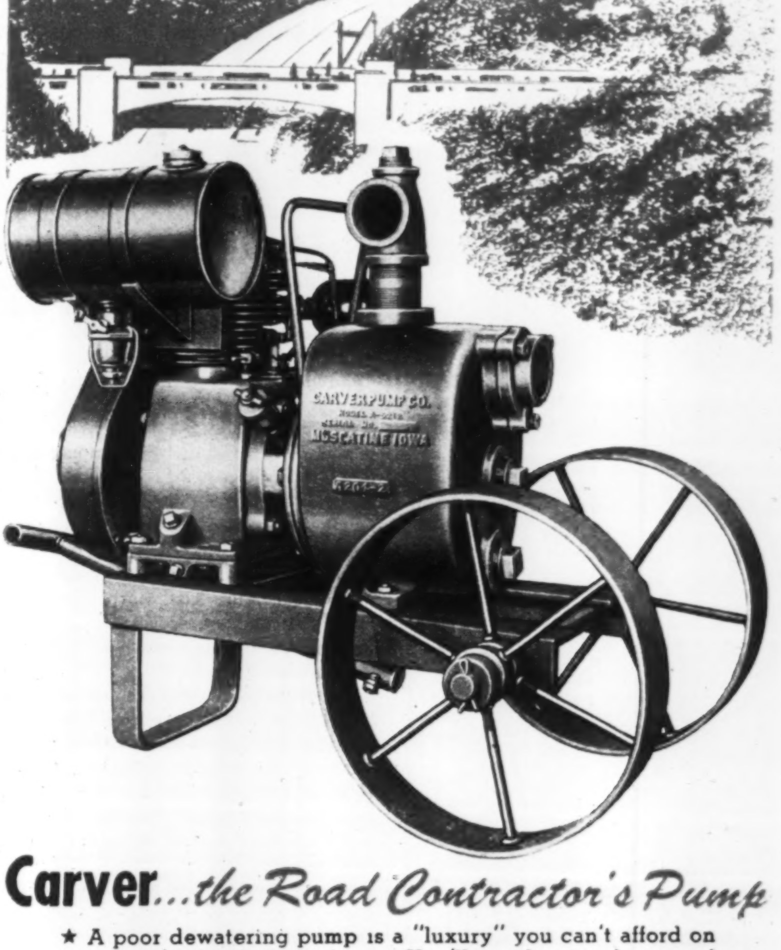
board will make recommendations
respect to engineering plans, cost
ates, contract specifications, finan-
plans and all general features of
ruction contracts for all major city
eering projects, exclusive of opera-
and maintenance.

hough in actual operation only a
weeks, the review board has re-
d some 35 individual engineering
cts for consideration. Several of
contemplate the expenditure of
substantial sums. To expedite its
ts, the board's present policy is to
der only those projects that offer
rehensive improvements in meeting
needs. Such projects are judged
e degree of necessity for the work,
ding their potentiality for produc-
mployment in the postwar era.

Active projects

ncipal construction projects now
reviewed include: street improve-
such as widening and paving;
ssways of the depressed, elevated
o-level type; sewer and water sys-
extensions; subways and traction
rnization; bridges and viaducts;
way improvements and airports.
e board's technical staff is limited.

in the foreground of tomorrow's
Construction Picture...



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It may, however, secure data and professional service from engineers employed by the various city departments, and it can engage consultants to assist with the work. The cost of studies for a particular department is charged directly to that department, while the cost of general studies is prorated among the governing agencies, the several city departments and bureaus.

A working capital fund of $50,000 has been appropriated by the city for activities of the Engineering Board of Review. All board members serve without compensation.

• • •

New contract signed for Colorado water

Harold L. Ickes, secretary of the Interior, has announced that he has now signed a contract to deliver to the state of Arizona annually 2,800,000 acre-ft. of Colorado River water released from water stored behind Boulder Dam. Delivery is subject to availability for use under the Colorado River Compact and the Boulder Canyon Project Act. The state would also get one-half of any excess unapportioned by the compact.

The contract will become effective when the compact is ratified by Arizona, whose legislature last March voted to ratify the compact, provided a contract for delivery of water was executed with the United States.

Mr. Ickes' signing of the contract followed a hearing before him Feb. 2 in Washington, at which Gov. Sidney P. Osborne of Arizona presented data. Hearings revolved around differences, lasting over 20 years, between California and Arizona, as to the amount of water to which each is entitled.

The hearing was not attended by Gov. Earl Warren of California, whose legislature is in session.

In 1922, six of the seven states in the Colorado River Basin agreed to the Colorado River Compact which apportioned waters from the river and its tributaries to the upper and lower basins, the division point being Lee's Ferry. The states constituting the Lower Basin are: Nevada, Arizona, and California, and parts of Utah and New Mexico; and those constituting the Upper Basin are: Colorado, Nevada, Utah, Wyoming, and New Mexico.

In 1928, the Congress passed the Boulder Canyon Project Act which agreed to limit its use of water to 4,400,000 acre-ft. apportioned by the compact plus one-half of the excess of unapportioned water. California passed such a limitation act in 1929.

The proposed contract was drafted by the Committee of Fourteen—made up of two representatives of each of the

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  Little Rock—R. A. Young & Son
CALIFORNIA
  Los Angeles—Smith Booth Usher Compa
  San Francisco—Edward F. Hale Company
COLORADO
  Boulder—Standard Machine Works
CONNECTICUT
  Hartford—The Holmes-Talcott Company
GEORGIA
  Atlanta—Tractor & Machinery Co., Inc
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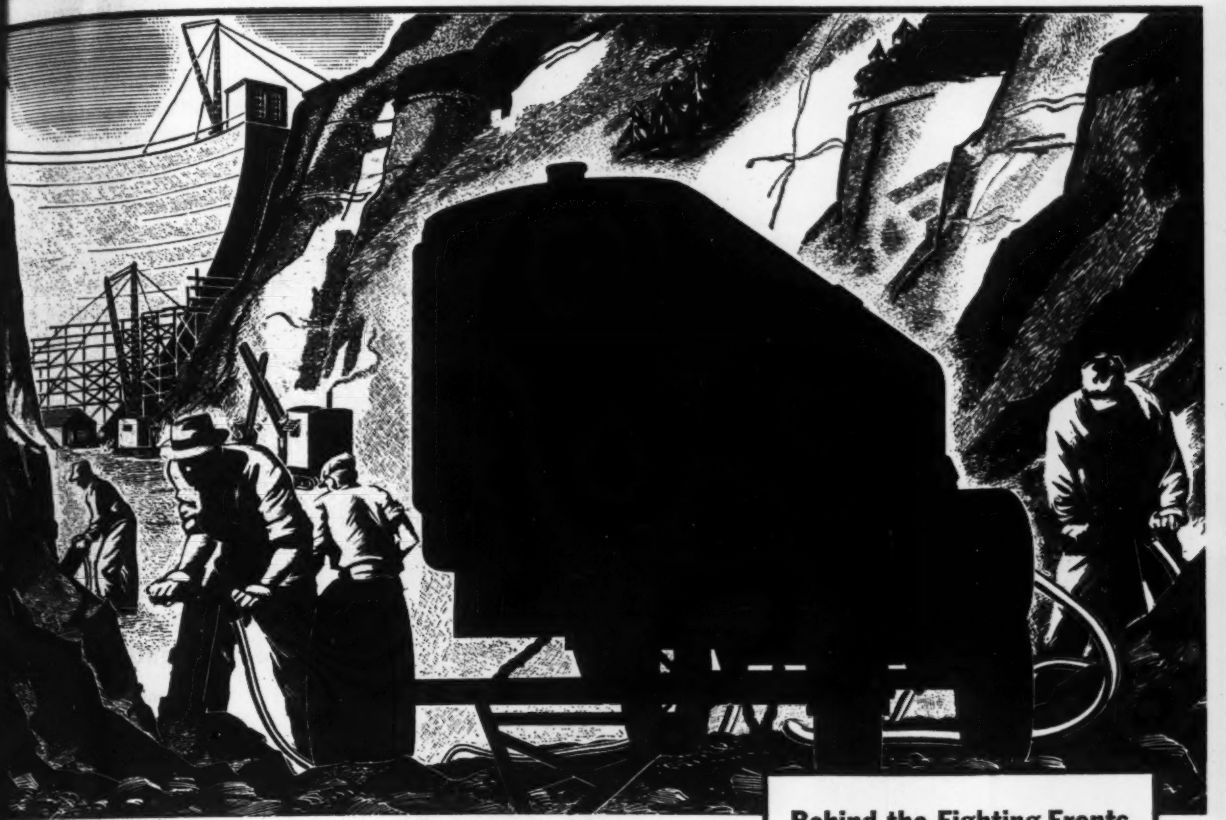
  Rockford—H. B. Faith Equipment Co.
INDIANA
  Indianapolis—Reid-Holcomb Company
IOWA—Des Moines—Elect. Eng. & Constr.
  Davenport—Industrial Engineering Equip.
KENTUCKY—Harlan—Hall Equipment Sal
  Louisville—Williams Tractor Company
LOUISIANA
  New Orleans—Wm. F. Surgi Equipment
MAINE—Ellsworth—Murray Machinery Co
MARYLAND
  Baltimore—D. C. Elphinstone, Inc.
MASSACHUSETTS
  Boston—P. I. Perkins Company
  Cambridge—W. W. Field & Son, Inc.
  Springfield—The Holmes-Talcott Compa
MICHIGAN
  Detroit—W. H. Anderson Company, Inc
MINNESOTA
  Hibbing—Arrowhead Equipment & Supply
  Minneapolis—The George T. Ryan Comp
MISSOURI—Kansas City—Machinery &
   plies Company
  St. Louis—Ryan Equipment Co.
MONTANA—Helena—Caird Engineering W
NEW HAMPSHIRE
  West Lebanon—P. I. Perkins Company
NEW JERSEY—Hillside—P. A. Drobach
  North Bergen—Amer. Air Compressor C
NEW MEXICO
  Albuquerque—The Harry Cornelius Comp
NEW YORK
  Albany—Larkin Equipment Company
  Albany—T. Southworth Tractor & Ma
   Co., Inc., Menands
  Binghamton—MacDougall Equipment Co
  Buffalo—Dow & Company, Inc.
  Corona, L. I.—The Jaeger-Lembo Mach. C
  Middletown—S. T. Randall, Inc.
  New York—Hubbard & Floyd, Inc.
  Olean—Freeborn Equipment Company
  Oneonta—L. P. Butts, Inc.
  Syracuse—Harrod Equipment Company
NORTH CAROLINA
  Durham—Constructors Supply Co., Inc
OHIO—Cincinnati—The Finn Equipment
  Cleveland—Gibson-Stewart Company.
  Marietta—Northwest Supply & Equipment
  Toledo—M. W. Kilcorse & Company
OKLAHOMA
  Oklahoma City—Townsco Equipment Co
OREGON
  Portland—Andrews Equipment Service
PENNSYLVANIA—Easton—Sears & Bow
  Harrisburg—N. A. Coulter
  Oil City—Freeborn Equipment Company
  Philadelphia—Metalweld, Inc.
  Pittsburgh—John McC. Latimer Company
  Wilkes-Barre—Ensminger & Company
SOUTH CAROLINA
  Columbia—Bell-Lott Road Machinery Co
SOUTH DAKOTA
  Sioux Falls—Empire Equipment Co.
TENNESSEE
  Chattanooga—James Supply Company
  Knoxville—Wilson-Weesner-Wilkinson Co
  Memphis—Tri-State Equipment Company
TEXAS—Dallas—Shaw Equipment Company
  El Paso—Equipment Supply Co.
  Houston—Dye Welding Supply Co.
  San Antonio—Patten Machinery Company
UTAH—Salt Lake City—The Lang Co.
VIRGINIA
  Richmond—Highway Machinery & Supply
WASHINGTON—
  Seattle—Star Machinery Company
  Spokane—Andrews Equipment Service
WEST VIRGINIA—Fairmont—Interstate
   gineers & Constructors
WISCONSIN
  Eau Claire—Bradford Machinery Comp
  Green Bay—Nelson Machinery Company
  Madison—Western Equipment Company
WYOMING
  Cheyenne—Wilson Equipment & Supply

Get more WORTH from air with
WORTHINGTON
Buy Blue Brutes
Worthington Pump and Machinery Co

To TAME A POST-WAR FLOOD



Brutes that help air-blast the ay through hell and high water going to be just as good and easy-breathing when they go r you on post-war jobs like this: *210,000 flood control plan for r reaches of the French Broad western North Carolina . . . r seven detention dams and a the Asheville, N. C. waterfront.* money on post-war flood conects is only one of many jobs es can help you do. Slum cleart construction. Removing street ge. Super-highways . . .

ans are ready now. So are Blue ind out today what makes these air-masters of the future world a better buy. Their Feather Valves,** (simplest, strongest valves for air compression ever made) and full force feed lubrication assuring oil under pressure to every working part through positive pump located in sump of crankcase — give you your money's worth by saving downtime, repair time, lost time, all around the clock.

The Blue Brute Compressor line is complete as well. Portable. Semi-portable. Diesel, gasolene or electric-driven. With Blue Brute Rock Drills and Air Tools to match their easy-breathing strength with easy handling. Check our improved Blue Brutes on wartime jobs today. Then bid to get your money's worth tomorrow!

Behind the Fighting Fronts with

BLUE BRUTES

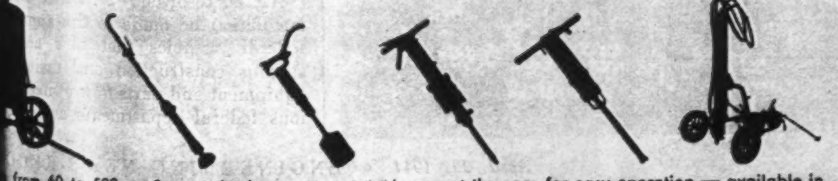
Blue Brutes helped build our giant Western dams, now supplying power to those light metal industries that give our aircraft wings. Columbia and Bonneville. Helped put up the power plants, too. Blue Brutes perform on 24-hour shifts in shipyards, bases, ordnance plants today — good proof of competence to help tomorrow's builders. Buy War Bonds now. Then buy Blue Brutes to get your money's worth! Your nearest distributor is listed on page 230.

Compressors and Air Tools are painted olive drab for the Army. **Reg. U. S. Pat. Off.

PC 4-2

more WORTH from air with WORTHINGTON

BUY BLUE BRUTES



from 60 to 500 cu. ft. capacity in mount[illegible] ll jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

WORTH BEHIND THE NAME WORTHINGTON

Worthington Pump and Machinery Corporation Harrison, N. J. Holyoke Compressor and Air Tool Department, Holyoke, Massachusetts

Easily angled to right or left for sidecasting.
HEIL
..for bigger loads and more yardage ..per day..per year

HEIL

Hydraulic Bulldozers and Trailbuilders

You get bonus loads with Heil dependable 4-wheel Scrapers . . .

Heil design gives you all-welded construction, fulcrum-type lift, ample tire clearance, more efficient performance under widely varying field conditions—feature after feature that will help establish your reputation as a successful operator.

Enjoy the benefits of easier maintenance, longer life, and simpler field repairs when working far from a supply base.

Write for bulletins giving details of Heil's advanced design.

SEE YOUR CLETRAC TRACTOR DISTRIBUTOR

The advanced design of Heil Bulldozers and Trailbuilders assures you of more speed, greater flexibility, and ability to take the tough jobs without wavering.

Heil's experienced fabricators have replaced many of the heavier members with welded box sections that are lighter, stronger, and easier to repair in the field without costly delays.

This equipment is tailormade to Cletrac Tractors, giving you full visibility for safe, efficient handling. The Heil hydraulic system comes close to a perfect leak-proof unit — stays in adjustment and gives you a minimum of trouble.

Achieve a reputation for "on-time" performance with Heil Earthmoving equipment.

Write for bulletins.

R-26

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

seven states—after Arizona last Ma
conditionally ratified the compact (E
May 20, 1943, p. 722). California
jected to the contract, according to
Ickes, for fear "that Arizona could c
tend, to California's prejudice . . . t
Arizona was entitled by this contract
2,800,000 acre-ft. of . . . water."

These fears, he says, are ungrounde
because delivery is "expressly subj
to its availability" under the comp
and the act; and also because the p
posed contract "expressly reserves
future judicial determination any is
involving the . . . interpretation of
compact and act." The Secretary s
further that the Department of the
terior has previously made contra
with California and Nevada for del
ery of water from Lake Mead, and t
Arizona is entitled to the same cons
eration as was given the other two sta

• • •

Used equipment dispos recommendations of AE

The vast amount of constructi
equipment such as tractors and b
dozers, cranes and shovels, paving m
chines and other construction equ
ment purchased by the U. S. gove
ment for use all over the world, sho
be used in postwar days by existi
federal agencies or sold to state a
local tax-supported bodies. The b
ance should be disposed of throu
established trade channels. These a
two of the principal points in a reso
tion drafted by the committee on d
posal of government surplus equipme
of the Associated Equipment Distri
tors and submitted by the A.E.D. to t
various chairmen of the Senate a
House committees, to the Surplus W
Properties Administrator, Chairman
the Senate Postwar Committee, t
chairman of the House Postwar Co
mittee, the U. S. Chamber of Co
merce, the National Association
Manufacturers, the American Ro
Builders Association and the Associat
General Contractors.

The Associated Equipment Distri
utors declare that the proper dispo
of such equipment, affecting as it w
returning soldiers and war workers, a
also affecting the pocketbooks of t
payers, becomes a vital problem whi
should be settled in "principle" a
by the Congress. The Treasury Pr
curement Division is already beginni
to dispose of surplus government su
plies.

A.E.D. resolved: ". . . that a reco
mendation be made to the appropria
federal agencies that new and us
surplus construction and maintena
equipment and parts now owned by v
ious federal departments and agenci

first transferred to other federal de-
tments and agencies in accordance
h their anticipated needs—for a 3 to
ar period, and that adequate sets
parts be furnished with such equip-
t, and also that surplus equipment
t exists after supplying such federal
ncies be then sold to local and state
-supported bodies at prices which
l enable the government to obtain a
r return.

"Further, that after such federal or
e and local agencies have been sup-
d with what equipment they can
orb, the balance be disposed of
ugh established trade channels of by
ring it for sale by public bids . . .
a rate of disposal which will not
luly disrupt trade and commerce."

he resolution also asks for protection
small business by inviting bids on
ll lots segregated by types, trade
es and models, and it also opposed
culative buying.

he sixth point of the resolution de-
res that surpluses of construction
maintenance equipment, held
oad, that are competitive with pro-
ts of the United States should be
posed of overseas, and debarred from
sequent import into this country.

Distributor members of the A.E.D.
mittee are: William A. Danner, of
Parker-Danner Co., Hyde Park,
ss.; Morton R. Hunter, Hunter Trac-
& Machinery Co., Milwaukee, Wis.;
l L. A. Boulay, The Taylor Tractor
, Columbus, Ohio.

Manufacturer members are: F. Sal-
, Harnischfeger Corp., Milwaukee,
s.; Henry N. Schramm, Schramm,
, West Chester, Pa.; E. R. Galvin,
G. LeTourneau, Inc., Peoria, Ill.;
il Spain, Caterpillar Tractor Co.,
oria, Ill.; R. K. Stiles, Austin-West-
Co., Aurora, Ill.; and H. R. Meeker,
D. Adams Co., Indianapolis, Ind.

• • •

Plan many new airports in Canada after the war

A project to encourage the building
400 new airports and landing strips
the small communities of Canada at
estimated cost of twenty million dol-
s is being developed by the Aero-
tical Institute of Canada, according
a statement of C. R. Patterson, presi-
t of the Institute, on his return to
onto following a cross-Canada tour
consultation and inspection.

Mr. Patterson will soon tour eastern
ada with a similar objective in view.
e proposed airports would serve as the
es for a vast network of feeder air
es to the Dominion's main air lines;
is said that they would provide for
efficient employment of 20,000 to
000 men of the Royal Canadian Air

The Heil Cable Dozer "digs in" for a big bite—to move a lot of dirt faster, more economically.

A simple adjustment changes over from extreme height for throwing to unlimited "down" thrust for deep penetration.

Blade raised to extreme height for "throwing."

HEIL

Cable Dozers

. . . easily adjusted for an extra deep bite . . . to move more dirt — faster

The Heil Cable Dozer digs at maximum depth, whether in soft dirt or in hard-packed clay — because Heil engineers have designed this rugged unit to penetrate into the ground up to the tractor's ability to push dirt. Simply place the side arms in the upper hole in the frame, and you can achieve super-penetration.

Heil Cable Dozers are engineered to work with International Harvester TracTracTors as a perfectly balanced team. The simplified mounting avoids obstructing operator's view—gives him full vision ahead. Here is a machine that performs smoothly . . . gives fast, positive action under the toughest conditions, with minimum maintenance.

Trailbuilder blade and "A" frame are interchangeable with the Bulldozer blade and frame.

Write for Bulletins.

R-25

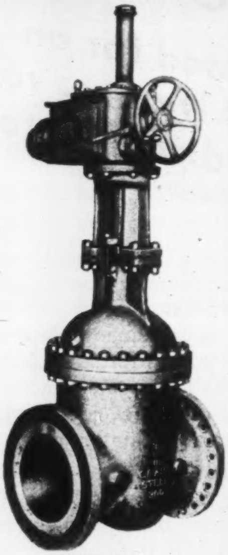
SEE YOUR INTERNATIONAL TRACTRACTOR DEALER

ARMY E NAVY

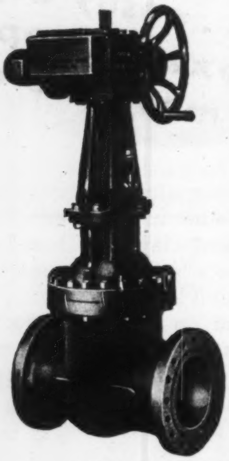
THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

PHILADELPHIA LIMITORQUE VALVE CONTROLS



Type S



Type M

LimiTorque Controls are made in many types, to fit all applications. Convenient push button stations can be installed close to the equipment and/or operation can be from a centrally located master control panel. This latter arrangement provides a constant and accurate knowledge of the status of all important valves throughout the plant at all times and allows the important operation of valve control to be handled easily, quickly and safely by responsible key workmen.

LimiTorque Controls are applicable to all types, and sizes of valves and can be adapted to existing equipment. Floor Stand Controls similar to those shown above can be furnished where it is not practical to fit the controls directly to the valve yokes.

Philadelphia
GEAR WORKS INCORPORATED
ERIE AVE. AND G ST., PHILADELPHIA 34, PA. NEW YORK • PITTSBURGH • CHICAGO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

at the end of the war just as soon ese men are discharged from the e.

e scheme aims at providing the rity of the 580 communities in da with a population of 1,000 or with either airports or landing . At present, 32 communities scheduled airline services, and 75 have airports used or developed r the Commonwealth Air Training

ancial details have yet to be ed out, but it is believed that cipalities and provincial govern- may share the cost as a post-war re. This is just one of many post- plans being considered in Canada.

• • •

exican public works ead to visit U. S.

n. Maximino Avila Camacho, sec- y of communications and public s of Mexico, expects to visit the d States shortly in the interests of r collaboration.

macho, under whose direction the st single section of the Pan Amer- highway is nearing completion, in- s to visit Washington, New York, Antonio, San Francisco and Los An- . He will call on President Roose- to discuss international cooperation ng the war period and after.

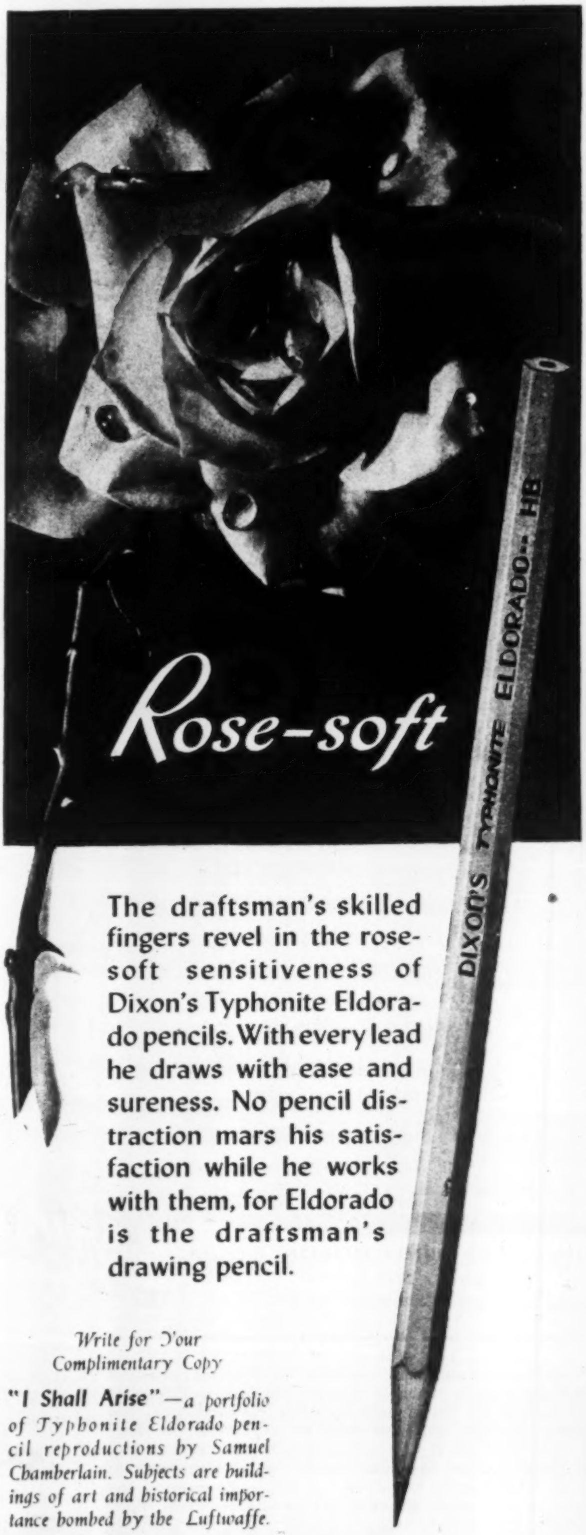
• • •

ontract awarded for ll-American canal link

ward of contract for work on 22 s more of the Coachella Canal in hern California under the Bureau Reclamation's war food program has n made to J. F. Shea Company, Inc., Los Angeles, according to Secretary he Interior Harold L. Ickes. The bid 1,660,681.90 was low among eleven tractors.

ork on the Coachella Canal, which part of the All-American Canal sys- , under the bureau's Boulder Can- project authorized in 1928, was ed by the War Production Board in ., 1942, after 86½ miles had been pleted. Resumption of the work fol- ed recommendations of the War d Administration and clearance by WPB for immediate construction.

our hundred days will be allowed for pletion of this 22-mile extension h will bring the canal to within w miles of the town of Coachella, if. The bureau is planning to call for for completion of turnouts and dis- ution systems in the near future hat they also may be ready in time provide a full supply of irrigation



The draftsman's skilled fingers revel in the rose-soft sensitiveness of Dixon's Typhonite Eldorado pencils. With every lead he draws with ease and sureness. No pencil distraction mars his satisfaction while he works with them, for Eldorado is the draftsman's drawing pencil.

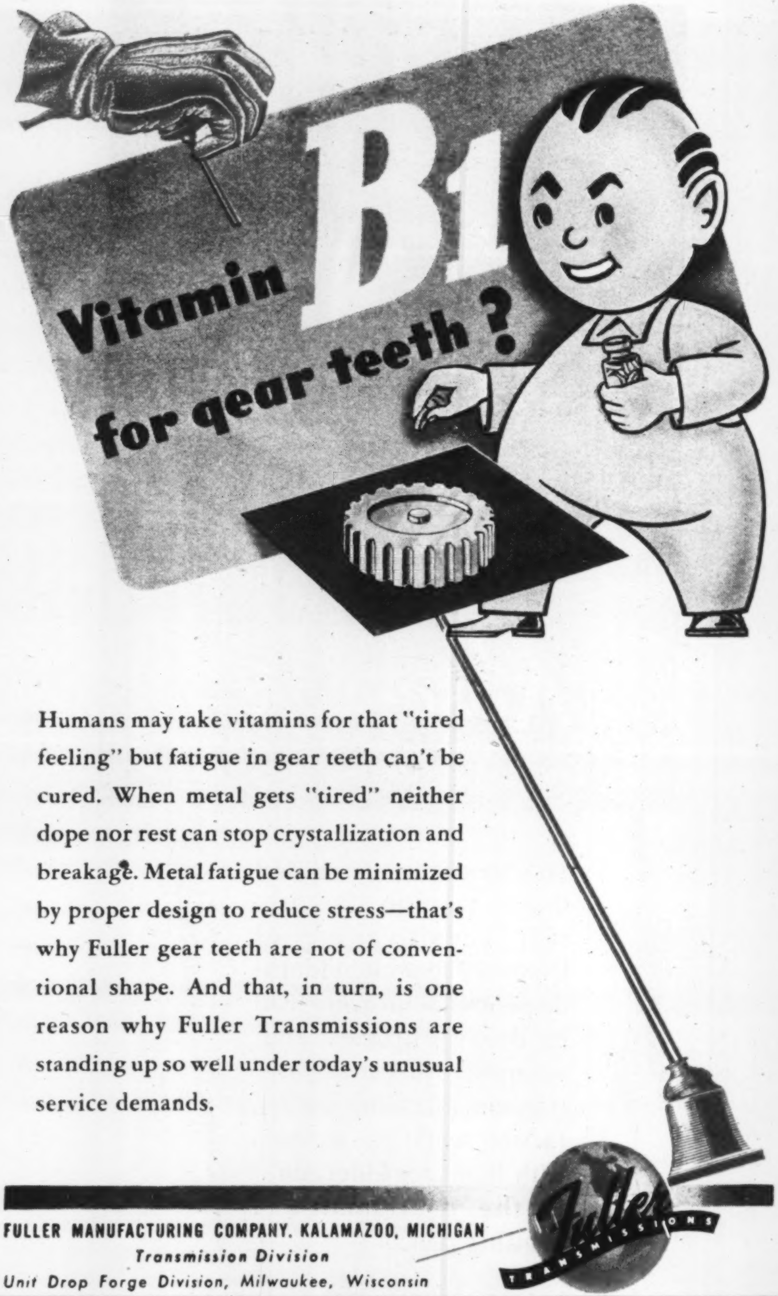
Write for Your Complimentary Copy

"I Shall Arise"—*a portfolio of Typhonite Eldorado pencil reproductions by Samuel Chamberlain. Subjects are buildings of art and historical importance bombed by the Luftwaffe.*

TYPHONITE

ELDORADO

Pencil Sales Department 227-J4,
Joseph Dixon Crucible Company, Jersey City 3, N.J.


Vitamin B1 for gear teeth?
Fuller
TRANSMISSIONS

Humans may take vitamins for that "tired feeling" but fatigue in gear teeth can't be cured. When metal gets "tired" neither dope nor rest can stop crystallization and breakage. Metal fatigue can be minimized by proper design to reduce stress—that's why Fuller gear teeth are not of conventional shape. And that, in turn, is one reason why Fuller Transmissions are standing up so well under today's unusual service demands.

FULLER MANUFACTURING COMPANY, KALAMAZOO, MICHIGAN
Transmission Division
Unit Drop Forge Division, Milwaukee, Wisconsin

water for about 10,000 acres of new la in the Imperial Valley and a supp mental supply to over 16,000 acres n faced with shortages.

Because of wartime restrictions steel, un-reinforced concrete will used to line those sections of the ca which must be reinforced. Numerous pass canals, diversion canals, dik highway bridges, wash-overchutes, other structures are included in contract.

• • •

N. Y. City will finance new Idlewild airport

The Coudert-Mitchell bill, author ing New York City to finance the Idlewild airport as a self-liquidat project, was signed by Governor Dew on April 6. It provides that a 30- bond issue may be issued for the pr ect, which is estimated to cost betw $60,000,000 and $100,000,000.

Mayor La Guardia requested Legislature to pass the bill, which pr vides for the establishment of a devel ment fund to be used for the acqui tion of land and construction and phy cal development of the airport. payments for permits, leases and oth airport privileges are to be paid this fund.

The city already owns much of land for this super-airport, which be located at the eastern end of Jama Bay in the Borough of Queens, j back of Far Rockaway beach on south shore of Long Island.

• • •

Many waterworks exhibitors

Wide interest in the general conf ence of the American Water Wor Association, to be held in Milwauk June 13-16, is reflected by the announ ment of Arthur T. Clark, secretar manager of the manufacturers associ tion, that within one week 60 of the booths had been reserved by exhibito

The Rud-o-Matic Tagline is operated on a spring principle and maintains at all times a positive tension sufficient to steady a clam shell bucket under any and all conditions, and will operate perfectly with the boom at any angle. It eliminates all the grief usually encountered with the average tagline as there are no weights, tracks, pins, carriages, or sheaves to wear out or to get out of order. Because of the large bearing and fewer sheaves, the saving on cable alone would eventually pay for it.

Tagline is complete with fair lead and cable attached and can be installed in less than one-half hour. Most of the crane manufacturers have adopted the Rud-o-Matic as standard equipment.

RUD-O-MATIC
foolproof
TAGLINES

McCAFFREY-RUDDOCK TAGLINE CORP.

2121 E. 25TH ST. **LOS ANGELES 11, CALIF.**

Represented by

FORSYTHE EQUIP. CO.
Long Island City, N. Y.

COMLEY EQUIP. CO.
Philadelphia, Pa.

W. E. PHILLIPS
Detroit, Mich.

L. L. HANSON
Chicago, Ill.

OWEN BUCKET CO., Ltd.
Berkeley, Calif.

You can't take one away from the other—the Steel, he Rope, the Men who make it, engineer it, and pply it to the drums and sheaves. They add up o rope service ● **ROEBLING** *"Blue Center"* **STEEL WIRE ROPE**

WHAT CAN YOU EXPECT from Roebling? Rope that has known capacity to deliver service. Engineering, in our plant and at your job, to put the rope to work right. Maintenance practices that protect its long life. › › Your postwar profits and postwar jobs will depend in part on operating rope-rigged equipment at lowest cost. You can leave that part to Roebling.

JOHN A. ROEBLING'S SONS COMPANY, Trenton 2, New Jersey
Branches and Warehouses in Principal Cities

JAR ROEBLING

ROEBLING

PACEMAKER IN WIRE PRODUCTS

WIRE ROPE AND STRAND • FITTINGS • AERIAL WIRE ROPE SYSTEMS • COLD ROLLED STRIP • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS • ROUND AND SHAPED WIRE • ELECTRICAL WIRES AND CABLES • WIRE CLOTH AND NETTING AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • SUSPENSION BRIDGES AND CABLES

Adams
DISTRIBUTORS
Headquarters for
MACHINERY and SERVICE

ALA.	Montgomery—Ray-Brooks Machinery Company
	Birmingham—Tractor & Equipment Company
ALASK.	Fairbanks—Glenn Carrington & Company
ARIZ.	Phoenix—O. S. Stapley Company
ARK.	Little Rock—Little Rock Road Machinery Co.
CALIF.	San Francisco & Los Angeles—J. D. Adams Co.
	Sacramento—Sutton Tractor & Equipment Company
	Redding—J. G. Bastain
COLO.	Denver—McKelvy Machinery Company
CONN.	New Haven—W. I. Clark Company
D. C.	Washington—Paving Supply & Equipment Co.
FLA.	Jacksonville & Miami—Florida Equipment Co.
	Tampa—Orange State Motor Co.
	Pensacola—Ray-Brooks Truck & Tractor Company
GA.	Atlanta—Tri-State Culvert & Machinery Co.
IDA.	Boise & Pocatello—Intermountain Equipment Co.
ILL.	Peoria & Springfield—A. E. Hudson Company
	Salem—E. W. Werner Motor Company
	Chicago—Great Lakes Supply Corp.
IND.	Indianapolis—J. D. Adams Company
	Newburgh—Matt W. Foster
IOWA	Des Moines—Herman M. Brown Company
KANS.	Wichita—S. H. Denney Road Machinery Co.
KY.	Louisville—Brandeis Machinery & Supply Co.
LA.	Baton Rouge—Dunham-Pugh Company
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MD.	Baltimore—Paving Supply & Equipment Co.
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MICH.	Bark River—Bark River Culvert & Equipment Co.
	Detroit and Grand Rapids—Wolverine Tractor & Equipment Co.
MINN.	Minneapolis & Duluth—Thorman W. Rosholt Co.
MISS.	Jackson—Mississippi Road Supply Co.
MO.	St. Louis—Missouri-Illinois Tractor & Equip. Co.
	Kansas City—Noel V. Wood, Inc.
MONT.	Billings—Industrial Equipment Company
NEB.	Omaha—Nebraska Tractor & Equipment Company
NEV.	Reno—Allied Equipment, Inc.
N. H.	Chester—R. C. Hazelton Co.
N. J.	Trenton—Ross, Young, Dilts Corp.
N.M.	Albuquerque—Hardin & Coggins
N. Y.	Groton—Clapp Machinery Company
	Buffalo—Dow & Company, Inc.
	Brooklyn—Edward Ehrbar, Inc.
	Long Island—George Malvese & Co.
	Albany—Slade Tractor Co., Inc.
N. C.	Raleigh—J. B. Hunt & Sons
N. D.	Fargo—Myhra Equipment Company
OHIO	Cleveland—Gibson-Stewart Company
	Cincinnati—H. P. Kelly Equipment Co.
	Cambridge—C. E. Major
OKLA.	Tulsa & Guthrie—C. L. Boyd Company, Inc.
ORE.	Portland & Eugene—Howard-Cooper Corporation
PA.	Butler—National Culvert & Equipment Co.
	Pittsburgh—Brinker Supply Company
	Philadelphia—Service Supply Corp.
	Camp Hill—L. B. Smith, Inc.
R. I.	Providence—Tractors, Inc.
S. C.	Columbia—N. H. Summers Road Machinery Co.
S. D.	Sioux Falls—Empire Equipment Company
TENN.	Knoxville & Chattanooga—Brooks Equipment & Mfg. Co.
	Nashville—Industrial Tractor & Equipment Co., Inc.
	Memphis—Road Builders Equipment Co.
TEXAS	Dallas & Houston—Browning-Ferris Machinery Co.
	San Antonio—Jess McNeel Machinery Co.
	Plainview—Plains Machinery Company
UTAH	Salt Lake City—The Lang Company
VT.	Montpelier—Vermont Road Equipment Co.
VA.	Richmond—Municipal Sales Company
	Roanoke—Roanoke Tractor & Equipment Corp.
WASH.	Spokane, Seattle, Walla Walla—Howard-Cooper Corporation
W. VA.	Charleston—Charleston Tractor & Equipment Corp.
WIS.	Eau Claire—Bark River Culvert & Equipment Co.

SEE
Adams
AD ON OPPOSITE PAGE

NEW AIDS TO THE CONSTRUCTOR

Air-Operated Pump

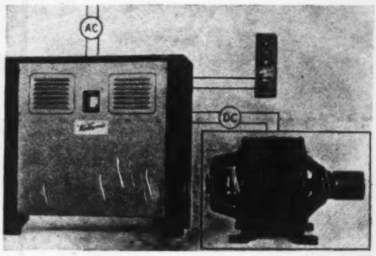
Of rugged, non-clogging construction, an air-operated pump has just been announced for pumping liquids direct from a barrel or other container to a spray gun.

It is claimed that use of this R.M.S. pump will eliminate the need for a pressure pot; containers may be refilled at any time without stopping the pump or interrupting spraying operations.—*Stephenson Air Brush Paint Co., 1630 Webster St., Oakland 12, Calif.*

• • •

Electronic Motor Drive

Featuring a self-contained package unit, applicable to any machine driven by a D-C shunt motor, a new electronic motor provides D-C motor performance from A-C power. Electronic rectifier tubes are employed to convert A-C to D-C supplying separate power to the D-C motor armature and field circuits. Each circuit is individually controlled through other electronic tubes to provide speed adjustment and current regulation, which prevents excessive current ripples, it is claimed. Full field strength of the motor and limited armature current is utilized in starting in order that maximum torque may be had without causing excessive power line surges and consequent interference with other equipment drawing power from the same distribution system.

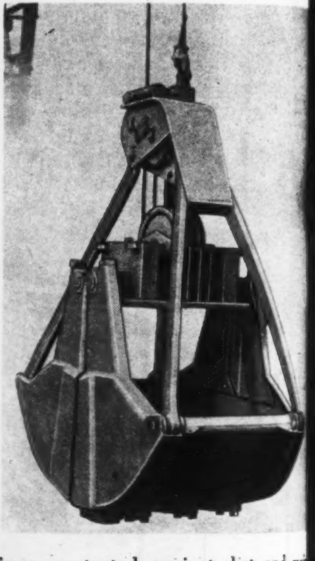


Standard motor drive capacities are ½ to 3 hp., single phase, and 5 to 10 hp., three phase. Standard voltages are 220/440 at 60 cycles; 550 volt and 25- or 50-cycle machines can also be supplied. Specially designed drives for specific applications are obtainable.—*Weltro Co., 20735 Grand River, Detroit Mich.*

• • •

Welded Clamshell Bucket

Equipped with a renewable mang nese steel lip, a new clamshell bucket of all-welded construction. Its clos sheaves are provided wtih needle be



ings, protected against dirt and mo ture by a special synthetic rubber se To prolong rope life, the sheaves are large diameter; guide sheaves are su stituted for guide rollers.

The welded design of the clamsh bucket permits great stability, it claimed, since the weight can be exac distributed.—*The C. S. Johnson C Champaign, Ill.*

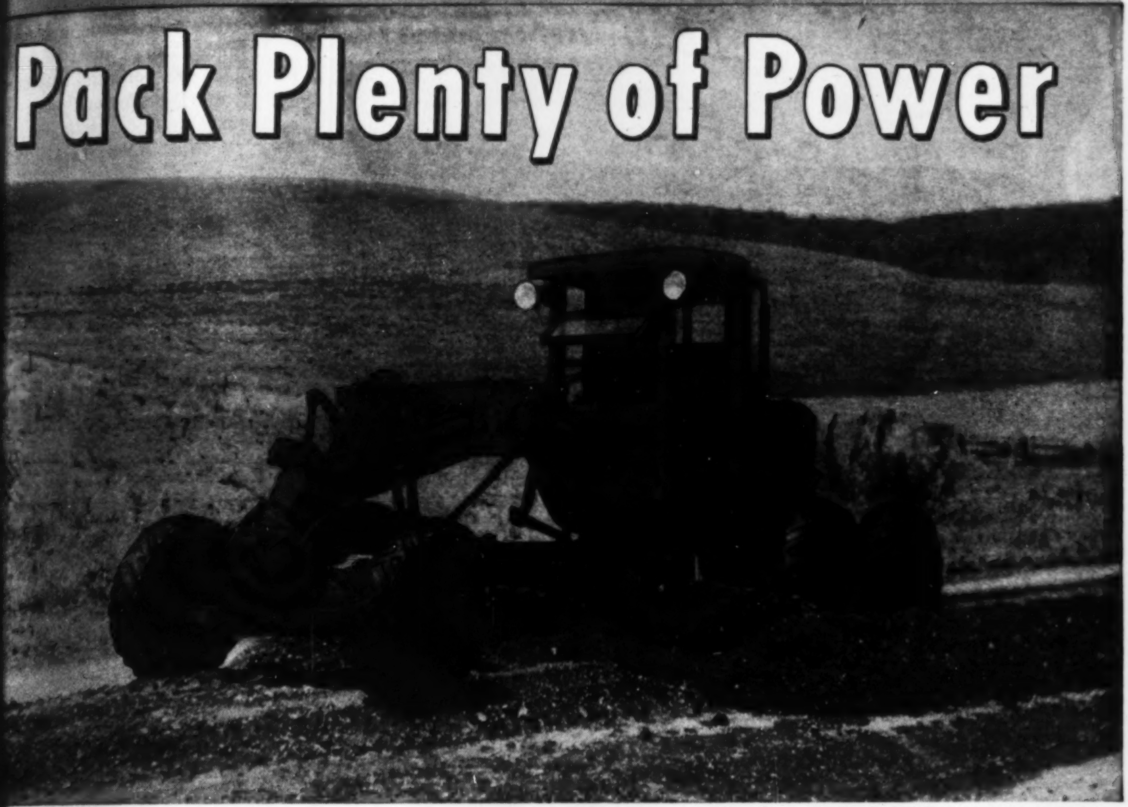
• • •

Circular Slide Rule

Small, light and accurate, the Monitor circular slide rule is indestru ible, it is claimed. An improved proc of graduating black lines on white vi ite makes for an average accuracy rapid calculations within ¼ of 1 p cent. This rule is greaseproof and wat

ADAMS MOTOR GRADERS

Pack Plenty of Power



One of a series of ads on Adams motor grader features

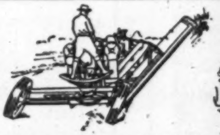
★TURNING a capacity load of heavy oil-mix material at 3 to 5 m.p.h. (as pictured above) takes plenty of power . . . and traction . . . but Adams heavy-duty motor graders have what it takes. All models of Adams motor graders pack plenty of power for their size enabling you to get out of any model the capacity built into it. When you get into an extraordinary load the engine has the torque reserve or lugging ability to hang on where some engines would stall. The operator never experiences the feeling that his machine is under-powered . . . Incidentally the Diesel engines used in Adams motor graders are started easily in any kind of weather and are very economical to operate and maintain.

Yes . . . their abundance of power, their long life, ease and economy of operation, their wide adaptability to all kinds of work . . . surface, ditch and bank . . . make Adams motor graders favorites among the several thousands of highway officials and contractors who own and know them. They will be your best buy when again you can purchase new machines. In the meantime, use the services of your local Adams dealer to keep your present equipment rolling.

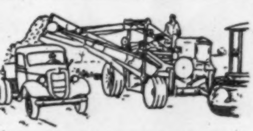
J. D. ADAMS COMPANY • INDIANAPOLIS, IND.

Granted a second Army-Navy Production Award for continued proficiency in the production of grading machinery for our armed forces

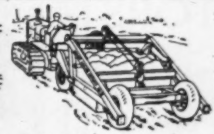
MOTOR GRADERS



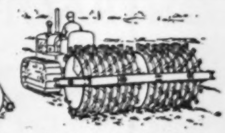
PULL-TYPE GRADERS



ELEVATING GRADERS



HAULING SCRAPERS



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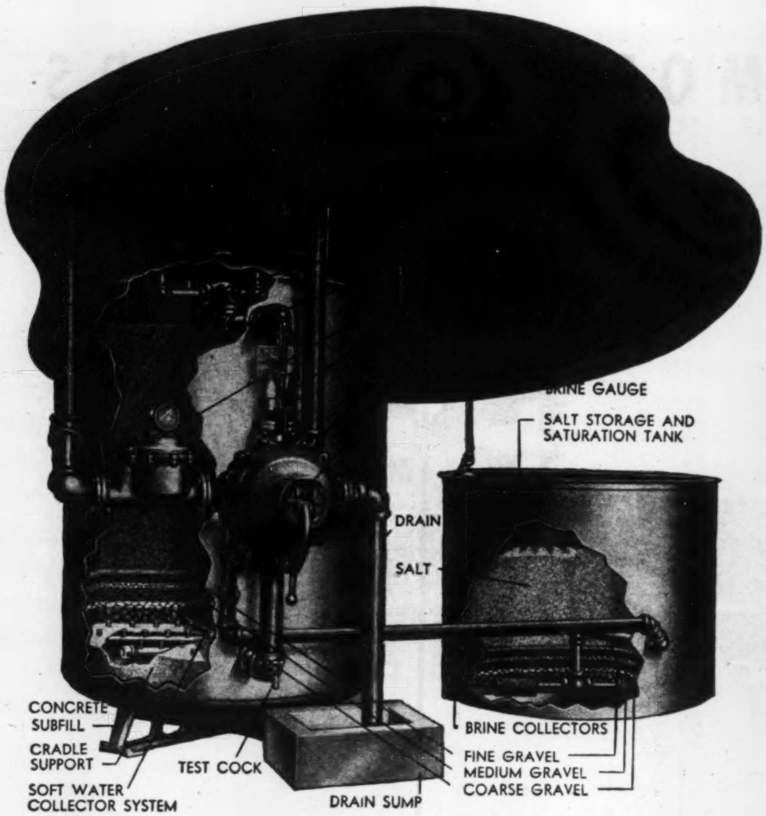

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Refinite Zeolite Softeners combine simplicity of construction with ruggedness—combine simplicity of operation with efficiency. The result is a softener that offers years of economical service. Notice these important features: the simple Multi-Port valve control; the efficient distributor and collector systems; the combination salt-storage and saturation tank; and the *FULL* bed of Refinite "Natural" Zeolite, which is possible without danger of loss in backwash.

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De Laval STEAM TURBINE CO.
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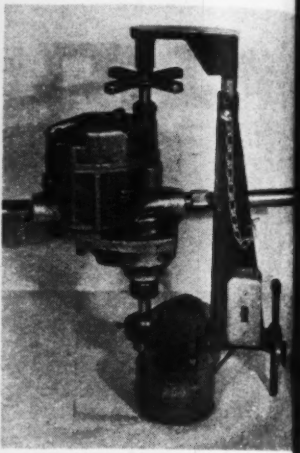
proof, and can be cleaned by wa
with soap and water.

The scales are on a disc 6 in. in di
eter; the length of the multiplica
division scale is 13.8 in. The front
of the slide rule has four scales—
C, D, and CI or C inverted scale;
reverse side has sine and tangent sc
and A and D scale for finding squ
and square roots.—*Tavella Sales Co.*
West Broadway, New York 7, N.Y.

• • •

Magnetic Drill Post

A magnetic drill post that is expe
to greatly increase speed of steel
drilling on ship construction is now
ing manufactured. The new tool is b
on an invention by Robert Johns



machinist with the Swan Island S
yard of the Kaiser Co. Through
principle of magnetism, the drill po
said to eliminate the former device
gave the drill purchase in deck
bulkhead work. A recent test sho
that the drill could complete i
hours work formerly requiring 70
hours.

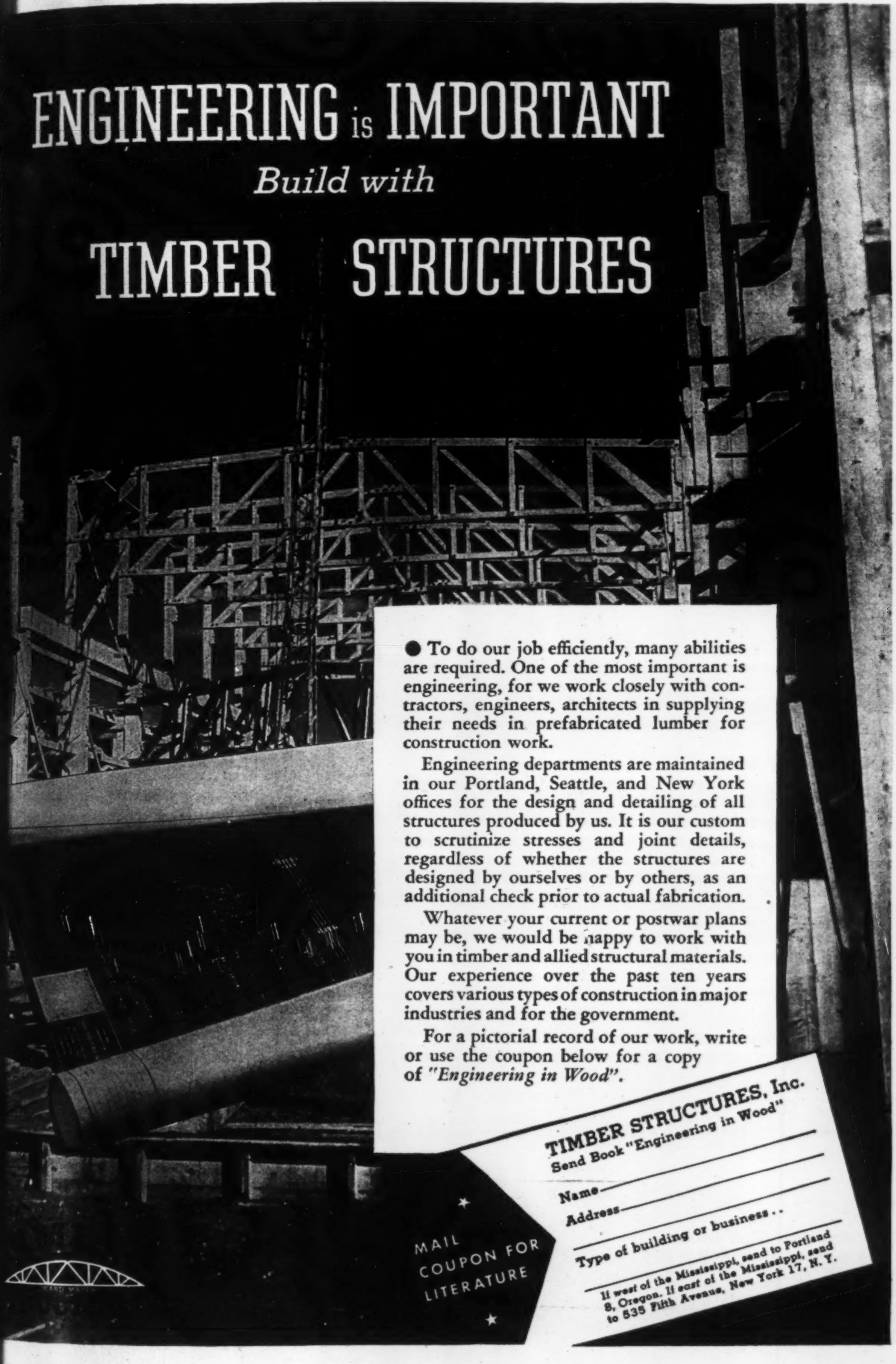
The new tool, weighing 37 lb., i
ready in use by the U. S. Navy
private shipbuilding organizations
the West Coast.—*Mechanical Rese*
Co., 610 Failing Bldg., Portland, Or

• • •

Two-In-One Valve

Close control and shut-off of vo
and pressure, it is claimed, are pos
with the new Type No. 608 butt
valve (patent applied for). Designed
either a high pressure drop and s
volume, or a low pressure drop
large volume, the valve is said to ope
beyond the limitations of a single v
It is easily adapted to power opera
and for operating pressures of 15 to
psi.

The larger beveled vane seats ag
the body of the valve; the smaller
is free-revolving. Either vane may



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six revolutions of the hand wheel.
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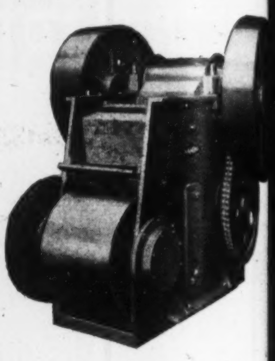
ing in one operation, a new D
dual-action crusher is light in
and saves horsepower, the manufa



states. The jaw, combining the
tions of both jaw and roll, weighs
6 tons.

This crusher occupies about the
space as a large jaw crusher; it i
to have a high production rate, w
flats or slivers.—*Diamond Iron W*
Inc., Minneapolis, Minn.

. . .

Go-Devil Tractor Crane

Lifting, transporting, loading an
loading are among the jobs perfo
by a new hydraulically operated
steered tractor crane. Known as
Drott Go-Devil, this tractor crane
large pneumatic tires, with oversize

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HIGHWAY DEPT.

front tires, for efficiency traction.

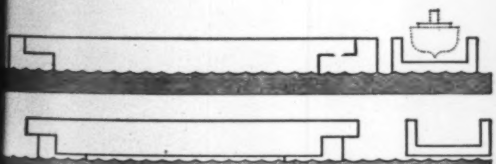
The unit has positive hydraulic
and down power, enabling the boom
handle loads up to 2,000 lb.; outrig
prevent tipping under heavy lo
Power-hydraulic steering insures
turning. All controls are within the
erator's reach. Other features of the
which is powered by a 4-cylinder,
gasoline engine, include a boom
swings a full 360 degrees; a 10
turning radius; traveling speeds

STEEL COMPANY
DIVISION
FRANCISCO YARD

Self-docking drydock

teel structure shown above at its erection site meda, Calif., is a floating drydock which, like huge porpoise, can lift itself clear of the water. drydock was fabricated and erected, and is , by Bethlehem Steel Company to service ships Pacific trade. It is capable of berthing the larg- mmercial vessels now plying the Pacific.

ocking Features



Drawings show side view of the floating drydock (1) in working position, and (2) with the center section raised by the end sections. At right, end views of center section.

ned by Rear Admiral (ret.) Frederic R. Harris, as patented many of its features, the drydock hree sections. The center section is designed to sed out of the water for the purposes of removing cles. For this operation, the two movable end s of the drydock are partially submerged, and moved under the center section, forming shelves on which it rests before raising. In similar manner, the end sections may be brought to rest on the center section, and then raised clear of the water. Thus the drydock is wholly "self-docking."

Launching—Local conditions suggested a method of launching which is believed to be unique. Instead of launching on shipways or in an artificial basin, it was decided to lower it into the water on sand jacks. Accordingly, falsework for construction was supported above the water on 20 jacking towers—clusters of four 28-in. jacks, 12 ft., 6 in. high. The launching date was chosen with regard to tide conditions, and the drydock, drawing 5 ft., 6 in., was lowered 9 ft., finally floating in 7 ft., 9 in. of water at high tide.

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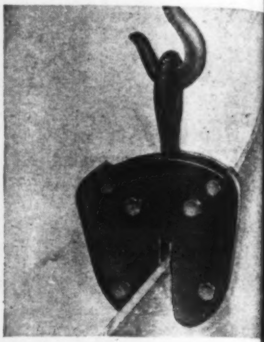
• • •

Steel Grab

Operating on the principle of a of tongs, a new steel grab handles plates and structural forms with thicknesses up to 5/8 in., it is stated grab, with a rated capacity of 3 to subjected to a proof of 5 tons befo lease from the factory.

This grab may be used for lifting tically or pulling horizontally. W is hooked and pressure applied



powerful, many-toothed jaws clo curely on the load, and hold it until the lift or pull is complete heavier the load, the tighter the This device is of solid, all-welded struction, with stainless steel w parts heat treated for addi strength.—*Mine Safety Appliances Braddock, Thomas and Meade St., burgh 8, Pa.*

• • •

Portable Heating Tank

As an addition to its line of he tanks for stationary units, a new

20 portable heating tank has just announced by the manufacturer.

This new model is well insulated equipped with electric heaters. I a motor and pump for circulating oil, and thermostats for maintaining

THE BUG THAT FOLLOWED A TREE FROM THE FOREST

mites were once practically un-
own to people who lived in
ses. But that was because the
nites thrived in forests, where
e was an abundance of wood
feed on. As many forests were
down, termites searched else-
re for their natural food. To-
termites may be found almost
where in beams, joists, porches,
s, subflooring—wherever they
build their tubes from the
ground line to reach wood.

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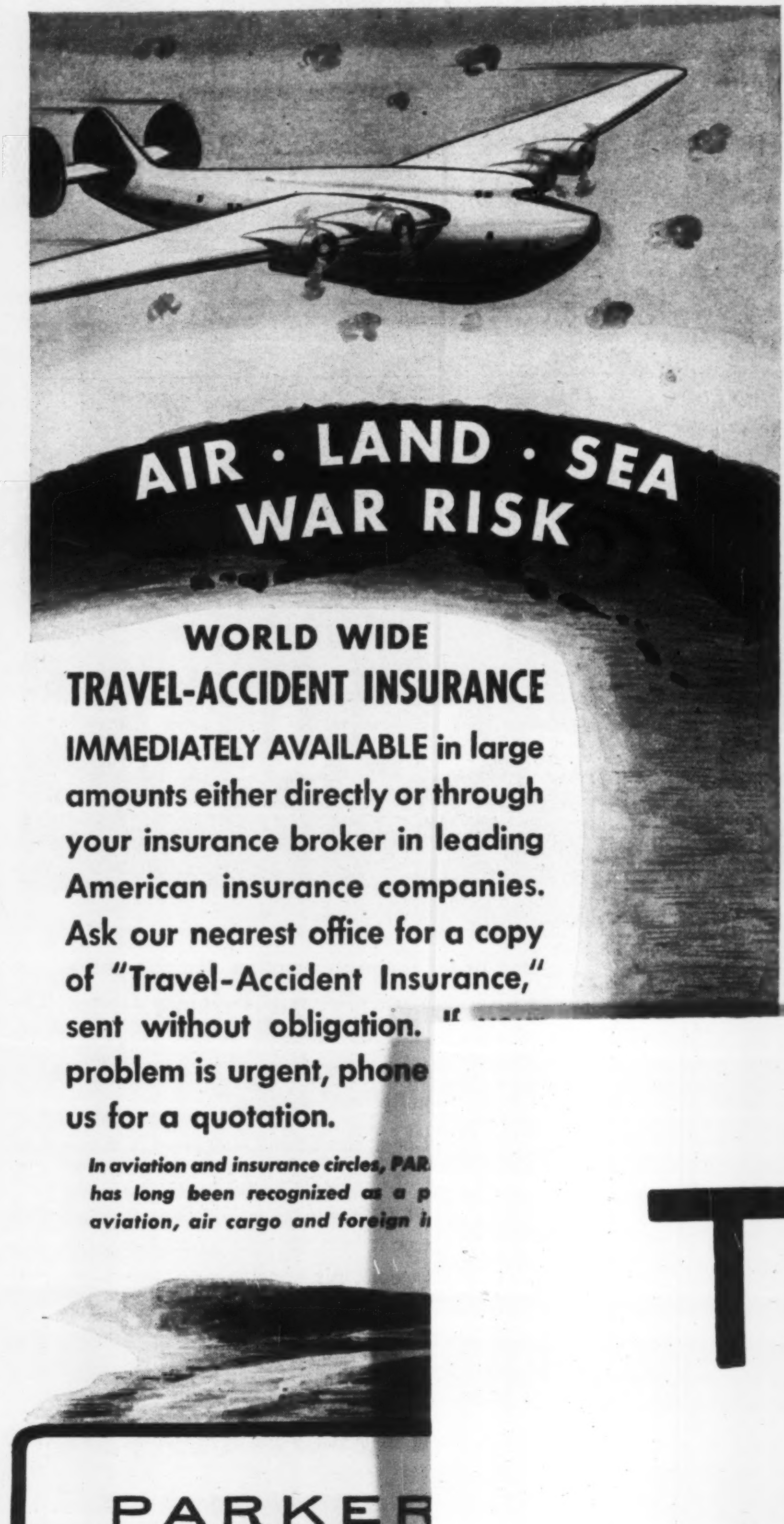
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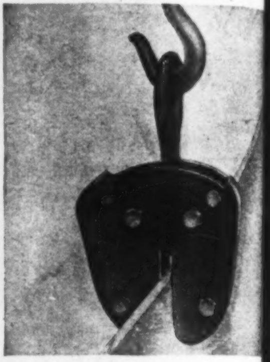
This grab may be used for lifting tically or pulling horizontally. W is hooked and pressure applied, powerful, many-toothed jaws clo curely on the load, and hold it until the lift or pull is complete heavier the load, the tighter the This device is of solid, all-welded struction, with stainless steel wo parts heat treated for addi strength.—*Mine Safety Appliances Braddock, Thomas and Meade St., burgh 8, Pa.*



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ground line to reach wood.

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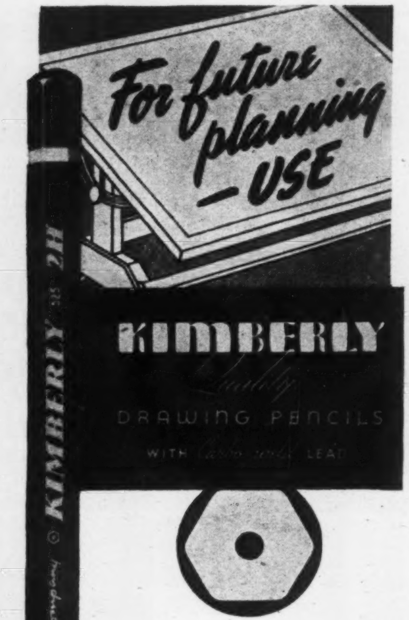

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oil temperature within certain limits. The tank comes complete with electric controls.—*Youngstown Miller Co., Sandusky, Ohio.*

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Composition Stair Treads

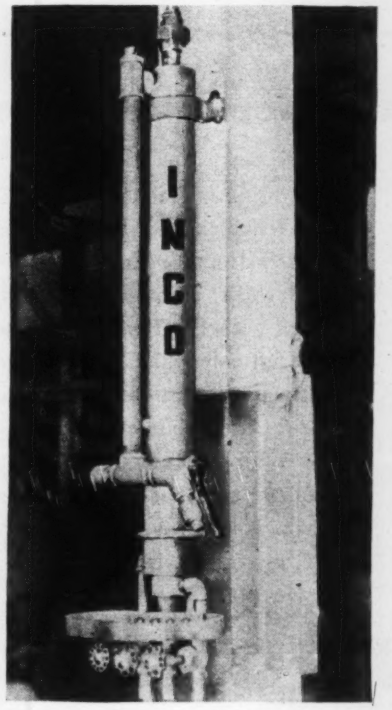
Although said to look, feel and wear like rubber, new stair treads are of asphalt and felt composition. Made with corrugated, non-skid surface, the treads are said to be waterproof, washable and long-wearing. These Dura-Val and Dura-Val de luxe treads are available in 9x18-in. standard size, and 9x18 and 9x24-in. nosing type. Extra sizes can be furnished on special order.—*So-Lo Works, Inc., Loveland, Ohio.*

• • •

Water Trap

Designed to relieve trouble with water in air lines, a new air-strainer water trap is said to save lubrication and cut maintenance costs as well. This Inco unit operates on the principle of high-velocity impingement on cold surface in three stages, to remove moisture and oil.

Not a master trap, this unit is designed to be placed in the air supply line nearest the air grinders and tools with which it is to be used. It is supplied with outlet connections to four pieces of equipment. Water exhaust valves provide for occasional release of trapped water.—*Inco Engineering Co., 200 Third St., N. E., Cedar Rapids, Iowa.*



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MANUFACTURE
ACTIVITIES

J. C. GANNETT, vice presiden Austin Co. and its eastern distr ager since 1928. has been appointed director of engineering, in charge of engineering and research, according to announcement by George A. Bryant, president.

A native of Wellington, Ohio, and a graduate of the University of gan in civil engineering. Mr. joined The Austin Co. as assista engineer in the Cleveland dis 1915, following five years of ex as field engineer, draftsman signer and supervising engineer road, coal, steel fabricating an neering companies.

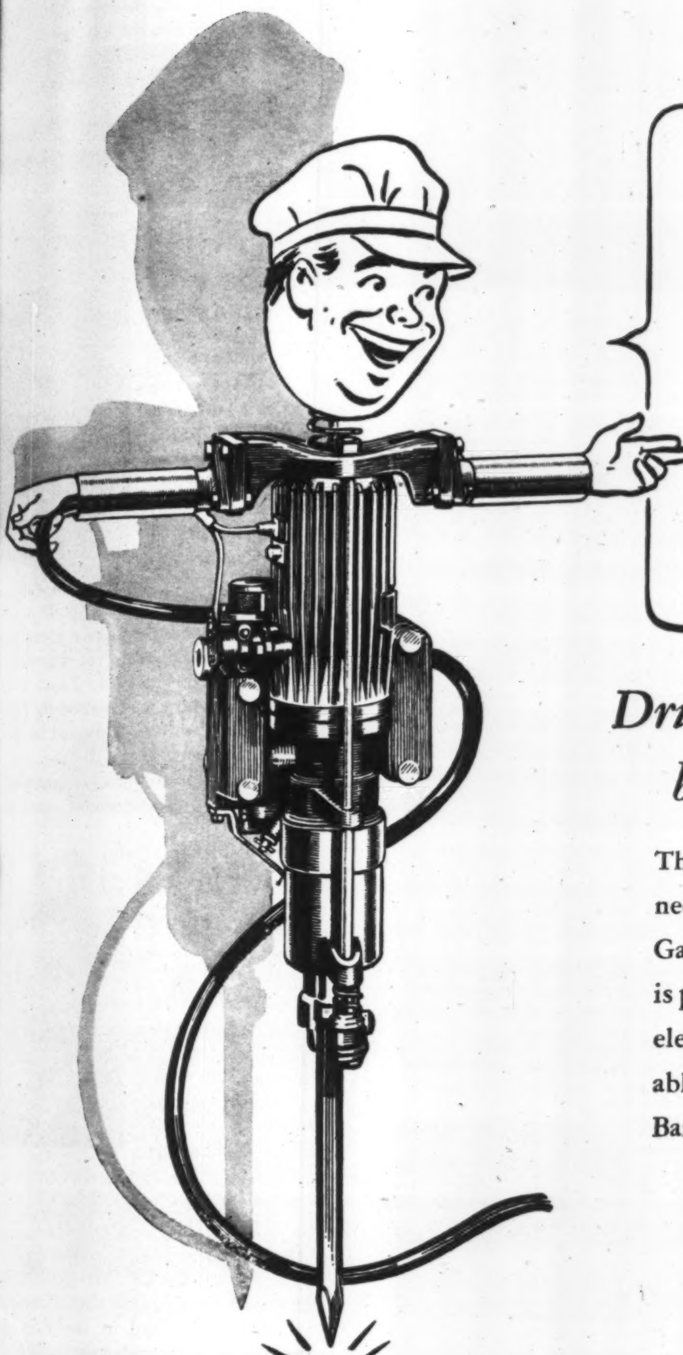
He served as Paris manager company during and after World and was named New York distr manager late in 1919, continuin post until he was named vice p and district manager. He is a of the American Society of Civil neers, the American Welding the American Concrete Institu the National Society of Profe Engineers.

The election of Albert S. L president of the company, now in of its Washington office, and Plant, vice president and Detr trict manager, as directors of Th tin Co. was also announced.

THE NEW PRESIDENT of the M Tractor & Machinery Co., Det "Jack" Frost. He had been lo New York as vice president of th Penn Machinery Co., in charge Mineola, Long Island, branch o service headquarters, but latte worked from the main office York City.

H. O. Penn founded the M Tractor & Machinery Co. a little year and a half ago, with head in Detroit and a branch office a ice plant at Grand Rapids, Mich

THE GUSTIN-BACON MFG. Co. City 7, Mo., has announced the ing changes in management pe A. L. Gustin, Jr. succeeds A. L. Sr., deceased, as president; J. phens, general manager of the



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trial department, becomes vice-president; J. D. Simmons has been elected to the board of directors; the other officers of the company remain: J. W. Foyle, vice-president; R. C. Harden, vice-president in charge of the eastern division; and C. L. Higgins, secretary and treasurer.

Arthur J. O'Leary has been appointed assistant manager of sales of Lukens Steel Co., and George W. Eshleman assistant.

Mr. O'Leary was born in Norristown, Pa., in 1898. In 1916, he joined the Pennsylvania Railroad as a member of its engineers corps. The following year, he entered the employ of Alan Wood Steel Co., Conshohoken, Pa. In December, 1926, he joined Lukens as a clerk in the shipping department. He entered the sales department in 1931. From 1941 to 1943 Mr. O'Leary was loaned by Lukens to the War Production Board in Washington where he served in the steel division in an advisory capacity on plates and general distribution of steel products.

Mr. Eshleman, who was born in Coatesville in 1904, is a graduate of Coatesville High School. He joined Lukens in 1927, working in the flanging department first as a shopman, then as a clerk. He transferred to the mill service department in 1933, and in 1935 joined the sales department.

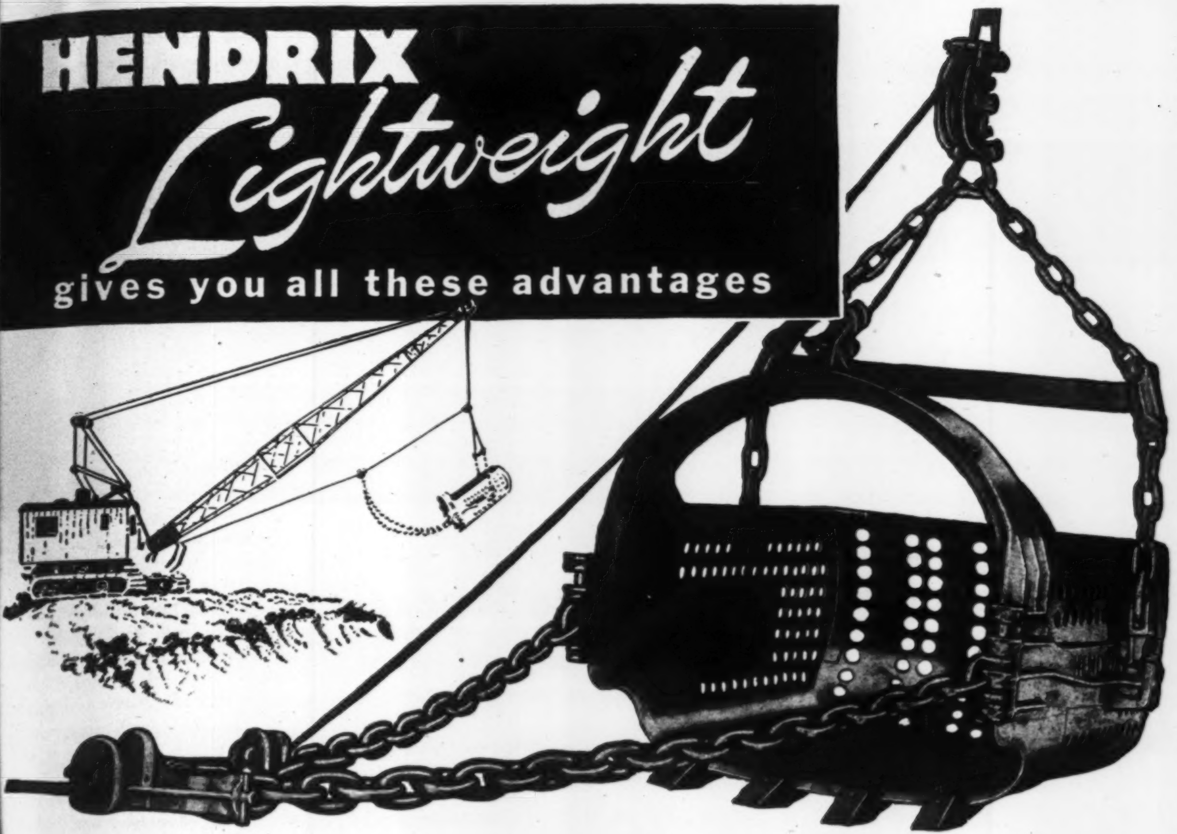
Henry J. Matthes, 61, oldest employee of the Louis Allis Co., Milwaukee, Wis., who posed for a bronze statue presented to Louis Allis, head of the firm, as a birthday gift several years ago, died Feb. 30. He had been with the firm 40 years.

Julius H. Holmgreen, 89, founder and retired president of the Alamo Iron Works at San Antonio, Tex., died at San Antonio recently.

Appointment of K. K. Lebohner as sales manager of Fiwale Equipment Mfg. Co. was announced recently. Mr. Lebohner will direct both foreign and domestic sales and advertising. A graduate of Alfred University, he has, during the past 15 years, had affiliations with The Cyanide Co., Rhoades & Co., and

HENDRIX *Lightweight*

gives you all these advantages

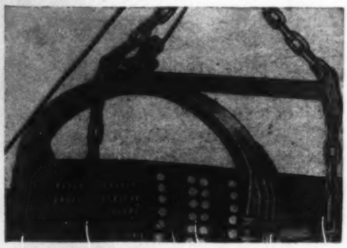


GREATER DIGABILITY • PERFECT BALANCE 20% TO 40% LIGHTER • FULL PAYLOADS ALL WELDED CONSTRUCTION

Excavating contractors and dragline operators all agree that the HENDRIX Lightweight gives them years of efficient, trouble-free service. These operators have long realized increased yardage by using a larger bucket than that for which their machine was designed, yet the allowable loaded weight is never exceeded. This principle applies in either regular or long boom operations.

You, too, can step up your yardage . . . move more material and move it faster with a HENDRIX Lightweight—the one bucket, unsurpassed for dry or wet digging.

HENDRIX Lightweight Buckets are available in three types—light, medium and heavy duty—⅜ to 20 cubic yards . . . with or without perforations. All have Manganese steel chains, fittings and reversible tooth points. Write for descriptive literature—or ask your dealer.



All-welded construction—no rivets. Manganese steel chains and fittings.

Round perforations are so arranged that overall strength of bucket is unimpaired.

HENDRIX
Lightweight **DRAGLINE BUCKETS**

DESOTO FOUNDRY, INC. • MANSFIELD, LOUISIANA

DAVEY
Air-Aristocrat
COMPRESSORS

Model 210 Air-Aristocrat Illustrated

. . . offer you these advantages!

✓ AIR COOLED — no water pumps to adjust, no jackets to drain or clean, no danger of freezing — lower service costs.

✓ ALUMINUM-ALLOY HEADS — again available in DAVEY compressors — allow heat dissipation three times as fast as cast iron, completely eliminating carbon formation on intake and discharge valves. No removal of heads to clean carbon, constant delivery of full air capacity.

✓ ENGINEERED FOR TROUBLE-FREE SERVICE — individual compressor cylinders . . . cylinders and heads separately removable . . . full force-feed lubrication . . . centralized control panel . . . heavy-duty industrial clutch (or fluid drive in Model 105-D) . . . electrically-welded chassis . . . skid- or wheel-mounted . . . available in 60, 105, 160, 210, and 315 cubic feet capacities.

DAVEY-ENGINEERED FOR RUGGEDNESS AND CONSERVATIVE SPEED

Some Distinguished Users of DAVEY Compressors

R. D. Baker Contracting Co., Detroit, Mich.
Barker Bros. Construction Co., Denver, Colo.
Consolidated Gas Company, New York City
Lane Construction Co., Meriden, Conn.
Oklahoma Contracting Co., Dallas, Tex.
U. S. Forest Service, North Fork, Calif.

Davey Also Manufactures a Complete Line of Industrial Compressors, Heavy-Duty Power Take-Offs and Pneumatic Saws.

DAVEY
Compressor Co.
KENT · OHIO

ARMY E NAVY

Write today for YOUR copy of the new Davey Catalog E-172

DEALERS IN PRINCIPAL CITIES

the New York office of Dixon & Co.

Fiwale, manufacturer of marine, netian blinds, and builders' hardw has recently moved its executive of to the Rollfast Building, Reade, Ch bers, and Church Sts., New York C

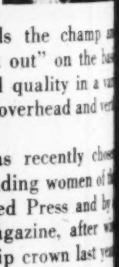
To effect a closer relationship with nation's shipbuilding program, Ow Corning Fiberglas Corp. has announced the transfer of A. E. Kincaid, Jr., from the general offices in Toledo, Ohio, to the Washington, D. C., office.

Mr. Kincaid has been manager of Owens - Corning's shipbuilding division since June, 19 He has visited nearly every shipyard the country and will maintain his as ciation with shipbuilders and mar contractors from Washington.

Associated with Owens-Corning si January, 1941, Mr. Kincaid has work closely with the Navy and shipbuilde in developing specifications for fibr glass materials used in war and m chant ships.

Mr. Kincaid is a native of Pittsbu and was graduated from Pennsylv State College in 1921. His former d in Toledo will be taken over by Ro C. Hurt, who has been his assistant

Vera Anderson, 20-year old welder at Ingalls Shipbuilding Corp. in Pas goula, Miss., successfully defended her title as the world's woman arc welding champion when she recently defeated the challenger Mrs. Edna Slocum of Moore Dry Dock, San Francisco. In the roped off "ring" on the platem at Ingalls the champ a challenger "fought it out" on the ba of welding speed and quality in a va ety of tests including overhead and ve cal welding.



Miss Anderson was recently cho one of the ten outstanding women of year by the Associated Press and by national women's magazine, after w ning her championship crown last ye

The American Mill Works of Auro Ill., announces the appointment of Ma B. Crowley as New York district ma ger. That district extends from Alba N. Y., on the north to Trenton, N. J. the south.

S. L. Fuller has been elected presid

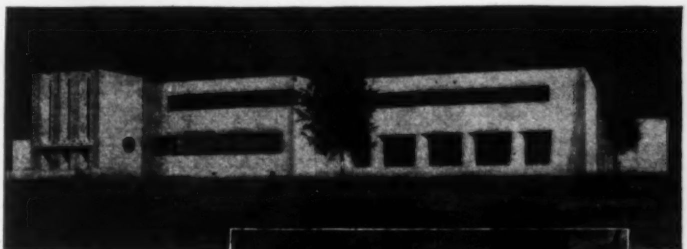
For the best possible concrete surfaces - - use

PLYFORM -*the Douglas Fir Plywood Concrete Form Panel*

• For your essential jobs today—and for all post-war construction—specify Plyform, the Douglas Fir Plywood made especially for concrete form work.

• Plyform makes possible the multiple re-use of forms—dependable forms that assure a smooth concrete surface. Plyform panels are large, easy to apply; they greatly reduce time and labor costs.

• Manufactured in strict accordance with U. S. Commercial Standard CS 45-42, Plyform is made with premium-grade water-resistant glues. Every panel is smooth-sanded, oil-treated and edge-sealed at the mill. Every panel serves as sheathing and lining combined. Write for free technical booklet —today.



Above: Flowing concrete lines distinguish this modern school building — "PLYFORMED" throughout.

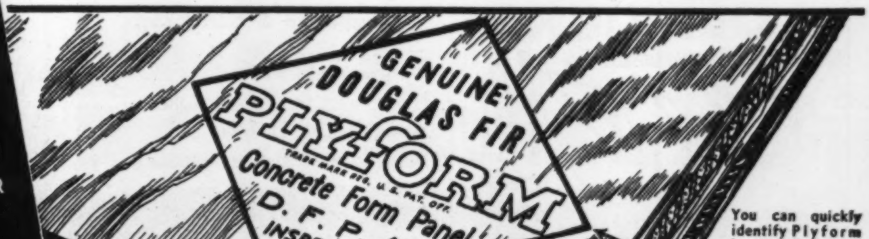
Right: The versatility and adaptability of PLYFORM can be seen in this actual "on-the-job" close-up.

Douglas Fir Plywood is now available only for essential war use. • • After Victory, this Miracle Wood will serve you in countless new ways.

Douglas Fir Plywood Association

Tacoma 2, Washington

DOUGLAS FIR
PLYWOOD
•
Real Lumber
MADE LARGER, LIGHTER
SPLIT-PROOF
STRONGER



You can quickly identify Plyform by its distinctive green edge seal and by this diamond-shaped "grade trade-mark."

How the Post-war Home can be heated for $31 per year

EL RENO PROVES CENTRAL HEATING PRACTICAL FOR SMALL HOME COMMUNITIES

This is the story of a housing project completed in 1937, by a man whose thinking was years ahead of his time. On a 1½ acre tract in Reno, Nevada, he erected 18 buildings—15 separate dwellings, a garage, caretaker's cottage, and a central heating plant. Every detail in the project was carefully planned to provide maximum comfort and convenience to tenants—who are well satisfied to pay fair rent for each furnished unit consisting of living room, dining alcove, kitchen, two bedrooms, a bathroom and lavatory. One of the outstanding features of the project is the central heating system—which provides ho water heat to the homes through Ric-wiL insulated under-ground conduit. Boilers use fuel oil. So efficient is this system that the heating bill for the entire project averages only $500.00 per year. Hot water for family use is also piped through Ric-wiL conduit from the central heating plant. These economies help the owner, Mr. Roland Giroux, to realize 13% net return on his investment.

EL RENO *Owner cites efficiency of Ric-wil Conduit*

"Regarding the cost of heating these sixteen units, here are the figures:

"Cost per month per apartment (5 rooms) for the 1937—1938 heating season:

"Total of 8019 gallons fuel at 6¼ cents per gallon.

Sept.	$ .81	Dec.	$5.12	Mar.	$4.94
Oct.	2.25	Jan.	5.50	Apr.	2.44
Nov.	3.75	Feb.	5.00	May	1.12

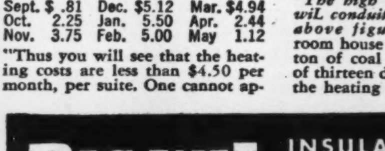
"Thus you will see that the heating costs are less than $4.50 per month, per suite. One cannot appreciate these heating costs unless they have been in the apartment business, where tenants will open windows rather than lower the room thermostat, when too warm.

"There is no question in my mind that central heating is more economical than separate units. *"The high efficiency of the Ric-wiL conduit is positive, from the above figures.* The average 5 room house in Reno will use one ton of coal per month, at a cost of thirteen dollars per ton, during the heating season."

As of Feb. 28, '44, Mr. Giroux Has This to Say: *"This data is as true today as when the buildings were built. About the only thing I could add is that the amount of fuel oil used has not varied 100 gal. per year since the system was installed seven years ago, which proves to me that the efficiency of the insulated conduit does not lower as time goes on. The upkeep has been zero."*

RIC-WIL INSULATED PIPE CONDUIT SYSTEMS
THE RIC-WIL COMPANY · CLEVELAND, OHIO
AGENTS IN PRINCIPAL CITIES

SASGEN ★ ★ DERRICKS



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Engineers & Contractors
for
Prestressed Gunite Tanks
Gunite work in all its Branches
Waterproofing, all types
Restoration of Masonry Buildings
Synthetic Rubber and other special Tank Linings
Dam Repairs and Reconstruction

285 Madison Avenue, New York, N. Y.
Murray Hill 3-0554

of the John F. Casey Co., Pittsburgh, Pa., succeeding the late C. E. Lott. Fuller has served the Casey Co. for 30 years, for 15 years as vice president in charge of engineering and construction and as treasurer. He is president of the Constructors' Association of Western Pennsylvania. The company board elected A. D. McCombs secretary and treasurer.

Philip S. Hill has been promoted to assistant manager, eastern division of the Willamette Hyster Co., Peoria, Ill. For the past two years he has been manager of the Washington, D. C., branch office of the Willamette Hyster Co., and prior to that was a district representative for the factory covering large territory in central United States and Canada. Hill has had long experience with the company, having started as a machinist in the Portland factory in 1933. Because of his ability and energy he steadily advanced through the positions mentioned to second in authority in the company's eastern organization.

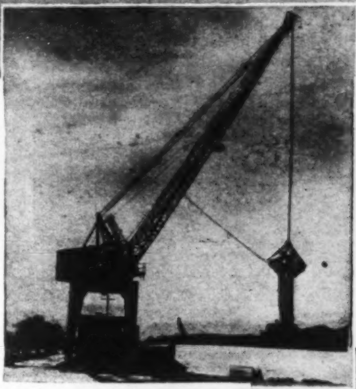
Frank McMillan has been advanced to manager of the Washington office to fill the vacancy left by Hill. McMillan joined the company early in 1942 in the production department and progressed through that department rapidly until after a few months he was advanced to the sales and service department, of which he was in charge until his recent advancement.

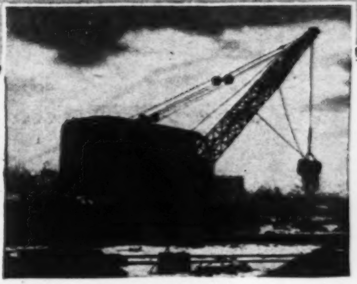
Since the Monarch Forge & Machine Works of Portland, Ore., received its first war contract two and a half years ago it has increased its production 1,000%, but during that time its personnel has been increased only 350%. Not an hour of production has been lost through labor difficulties.

Monarch's first contract was with Willamette Iron & Steel Corp. for the production of reverse shaft assemblies, air pump beams, throttle valves, and relief valves for Liberty engines. Then they began delivering identical items to the Iron Fireman Manufacturing Co. In addition to that work Monarch has completed contracts for cargo boom fittings, rigging equipment, blocks, and oxygen compressors. The plant is currently working on rudder bearings, roller

American MATERIALS HANDLING FOR EVERY INDUSTRY

MERICAN General Purpose Hoist


AMERICAN REVOLVER
Gantry-mounted Revolving Crane ➡

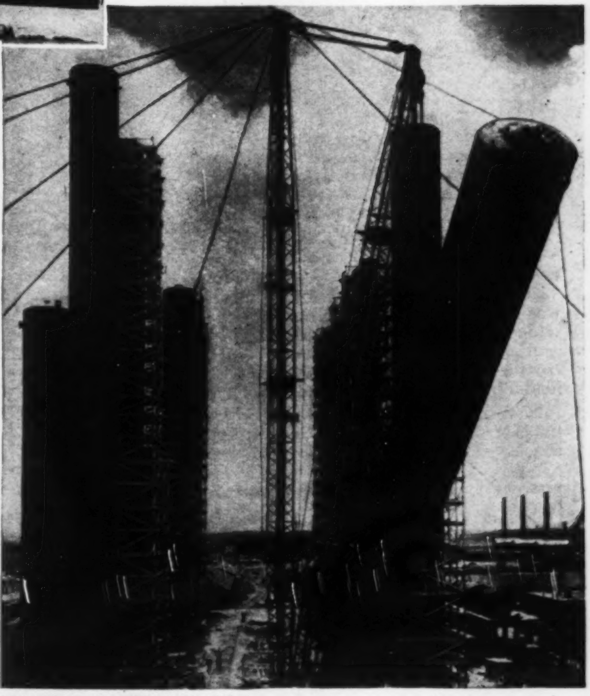

AMERICAN Locomotive Crane

AMERICAN DERRICKS SPEED VITAL CONSTRUCTION

If your materials handling is a derrick job, there is an AMERICAN for it. In Guy, Stiffleg, Steel Erector's, and special types there is a selection of size, length of boom, and lifting capacity.

An AMERICAN designed and built derrick has construction features that facilitate erection and dismantling for shipment. These fine derricks assure rapid progress in your work with economy and safety. Powered with an AMERICAN Hoist, an AMERICAN Derrick is an efficient materials handling method.

Catalog No. 200-D-1 gives full particulars.


COURTESY N. W. AYER & SON, INC.

AMERICAN 200 TON GUY DERRICKS ERECTING BUTADIENE TOWERS 17 STORIES HIGH

Plan now . . . but wait for **AMERICAN!**

447

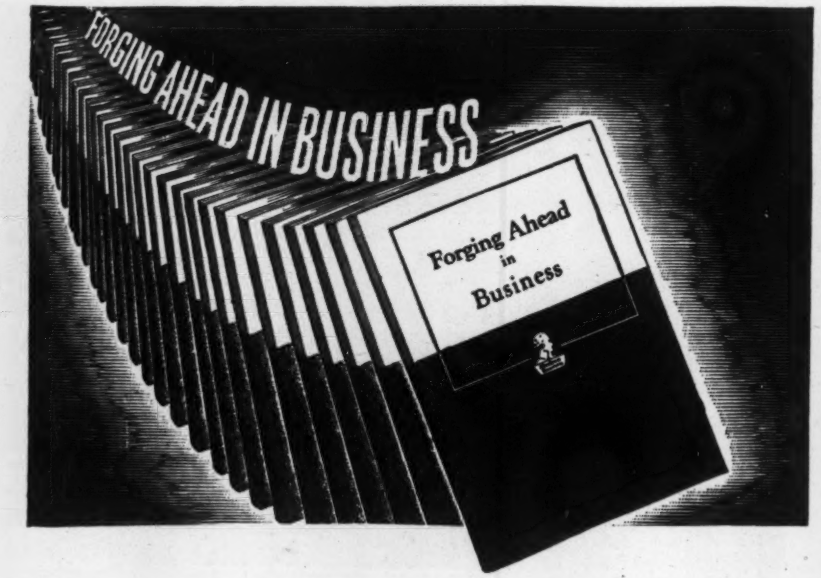
AMERICAN MATERIALS HANDLING *for* EVERY INDUSTRY

AMERICAN HOIST & DERRICK CO.

Saint Paul 1, Minnesota

CHICAGO SAN FRANCISCO NEW YORK

Wherever wire rope is fastened . . . . use genuine **CROSBY CLIPS** *with the Red-U-Bolt*



All Serious-Minded Production Men

SHOULD HAVE THIS FREE BOOKLET!

FORGING AHEAD IN BUSINESS contains a message of particular importance to production men. This is your opportunity to obtain a copy of this famous book, which has been described as a "turning point in the lives of literally thousands of men"!

Although "Forging Ahead in Business" has been distributed to more than 3,000,000 men, today's timely edition was written in the light of recent world-wide developments. Its 64 pages represent more than three decades of successful experience in training men for leadership in business and industry.

It demonstrates the method which the Alexander Hamilton Institute uses to give you immediate help in your present position, while preparing you for post-war opportunities. Subjects directly related to the work you are doing now, PLUS other subjects of fundamental value to the business executive, are discussed in the book and placed in significant relation to one another. Thus, a helpful, over-all picture is provided.

Said one man who had sent for "Forging Ahead in Business":

"In thirty minutes this little book gave me a clearer picture of my business future than I've ever had before."

. . . and that represents the opinion of the Institute's 400,000 subscribers, *including 134,000 production men!*

The booklet further explains how it is possible to offer this essential training in a minimum of time; how the Institute program fits in with the most crowded of war-time schedules.

Among the prominent industrialists who assisted in the preparation of the Course, which is described in "FORGING AHEAD IN BUSINESS" are: Alfred P. Sloan, Jr., Chairman of the Board, General Motors Corp.; Thomas J. Watson, President, International Business Machines Corp., and Frederick W. Pickard, Vice President and Director, E. I. du Pont de Nemours & Co.

Send for "FORGING AHEAD IN BUSINESS" TODAY!

Frankly, this booklet has no appeal for the immature mind. It does not interest the man who, for one reason or another, is wholly satisfied to plug along in a mediocre job. But, for the alert, future-minded individual—the man with ambition and "drive"—"Forging Ahead in Business" has a message of distinct importance. If you feel that it is intended for you, don't hesitate to send for a copy today. Simply fill in and mail the coupon below.

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chocks, roller fair-leads, davits, rud
pintles, anchor windlasses, capstans, a
steering engines.

The United States Plywood Corp. a
nounces the appointment of Ray Ar
as manager of its newly-created door division, part of the corporation's expansion program, directed particularly to the postwar era.

Mr. Arndt has devoted his entire business career of more than thirty years to the lumber, millwork, plywo
and construction industries, with sal
and manufacturing experience exten
ing from the Pacific to the Atlantic.

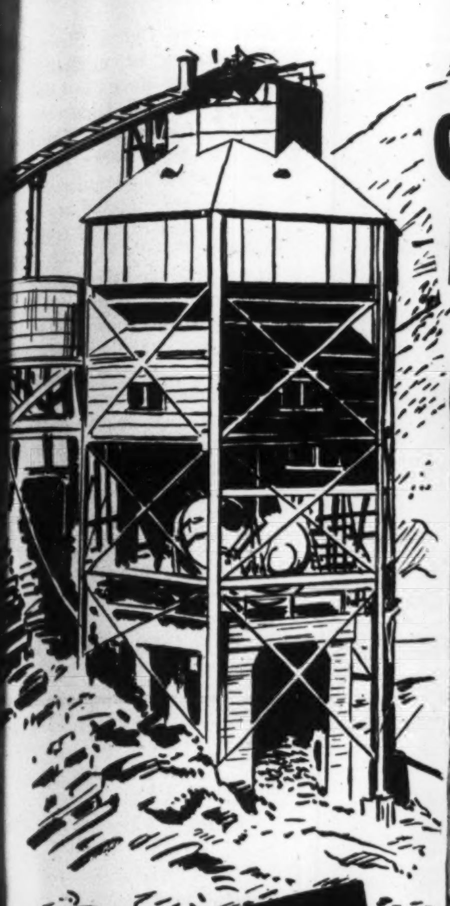
Previous to joining United States Ply
wood, Mr. Arndt was eastern distri
manager for the Oregon-Washingto
Plywood Co. for nine years. His pri
affiliations were with Convertible Do
Manufacturing Co., Milwaukee, an
Sears, Roebuck & Co., with the latter a
sales manager, Chicago district, of th
modern home division. Early in hi
career, Mr. Arndt worked in Paci
Coast lumber mills.

F. D. Hesley, head of Todd Er
Basin Dry Docks, Inc., has been ap
pointed general manager of the Lo
Angeles Shipbuilding and Dry Doc
Corp. of San Pedro, Calif., assigned t
the Todd Corporation by the U. S. Nav
on Dec. 8. J. William Jamin, formerl
head of Todd Hoboken Division, be
comes general manager of Todd Er
Basin, and Henry F. Gelhaus, assistan
general manager. At Todd Hoboken
Carleton Shugg succeeds J. Willian
Jamin as general manager, and Werne
Keller has been appointed assistan
general manager. Shugg was formerl
production manager, and Keller gen
eral superintendent.

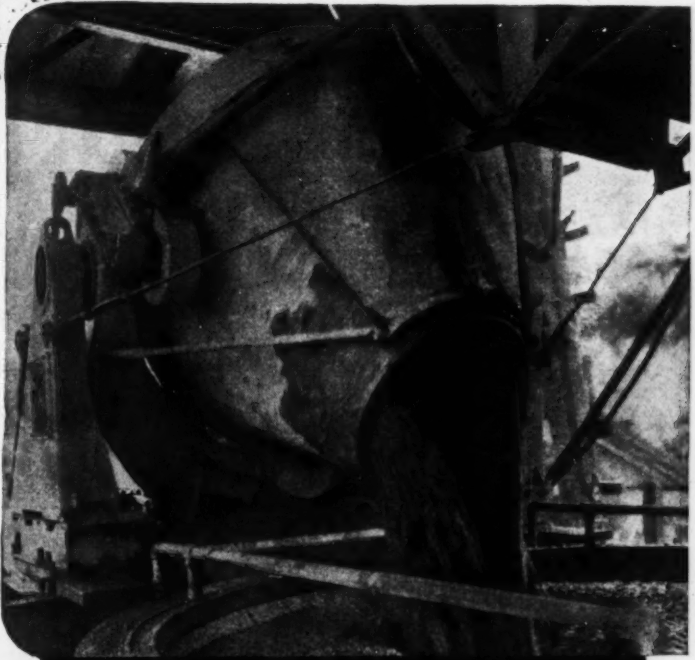
Other appointments at the Los Ange
les plant include Ross W. Copeland
former general manager of Housto
Shipbuilding Corp. as assistant genera
manager in charge of shipbuilding;
Herman Minikine, former superintend
ent of repairs at Todd Erie Basin, a
assistant general manager in charge o
repairs; Joseph J. Redington, wh
served for years in the Navy's Construc
tion Division, special assistant to th
general manager; Charles A. Lane o
the New York office, administrativ
assistant; W. G. Abernathy, also of the
New York office, in charge of account
ing; and Arthur Sewall, customers' re
lations.

Many Production records have been

QUALITY CONCRETE AT RECORD SPEED



DEPEND ON YOUR KOEHRING DISTRIBUTOR to help you keep your equipment operating. Care for your Koehring equipment NOW, so it will serve you tomorrow. Koehring distributors have genuine Koehring parts. Koehring parts warehouses are at your service.



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Koehring Tilting and Non-Tilting Mixers have established pouring records on many large volume concrete jobs . . . dams, spillways, locks, bridges, power plants, drydocks, etc. for both peace and wartime projects. Koehring Construction Mixers have specially designed non-clogging drums and drum interiors to produce thoroughly mixed, quality concrete. They are substantially constructed to operate day and night continuously for maximum yardage production. *Plan now* for a Koehring Mixer for postwar construction. Consult our distributor or write to us for information.

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Milwaukee 10, Wisconsin

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ARMY E NAVY

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HEAVY-DUTY CONSTRUCTION EQUIPMENT

The Bridge went UP
Thomas A. Edison Bridge, New Jersey
but
RICHMOND
FORM-TY ENGINEERING
kept FORM costs down!

RICHMOND 10-WAY SAVING PLAN

1—Provides all kinds of form-tying devices to choose from.
2—Economizes because Form Ties cost less to use than wire, band or rod ties.
3—Supplies Form Ties engineered for safe working loads of 1,500-30,000 lbs.
4—Assures faster erecting and stripping plus big lumber savings.
5—Promotes perfect alignment for correct wall thickness.
6—Protects job against rust staining with "1 to 3 inch cutback".
7—Saves shipping and handling costs because of scientifically reduced weight.
8—Is only known prevention against termite destruction.
9—Enables you to borrow working parts and to pay only for ties in the job.
10—Is planned from job plans to use the right size of ties and the least number of ties to fit forming for fast, safe work.

Whether you are planning, designing or estimating on a concrete job—large or small—there are *Dollars* to be saved on *Form Work* by planning.

Richmond Services to Architects, Engineers and Contractors include recommendations on Form Tying Devices, Consultation on Form problems and Forming used, as well as Estimates on requirements, all without obligation.

The list of big jobs on which Richmond Form Ties have saved on form-work costs and speeded up completion is a blue-ribbon list of modern construction. It includes mammoth projects everywhere—and small contracts, too. There is a Richmond Tie engineered for every type of concrete construction. We plan a Tie to fit the work.

For information, write to our Planning Division.

SEE OUR CATALOG IN SWEET'S

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Established 1911 •

TIME AND LABOR SAVING CONSTRUCTION DEVICES FOR CONCRETE CONSTRUCTION

broken by United States St
subsidiaries in producing 6
tons of steel since Pearl Harbo
ing to Irving S. Olds, chairma
board of directors. The new
include high marks in produ
raw materials, manufacture of
steel ingots, finished products,
construction of naval craft.

U. S. Steel's electrolytic ti
lines, plus facilities for chemi
ment of black plate for contain
made possible the saving of 40
lb. of our vital tin supply.

An $811,000,000 expansion
was embarked upon to meet w
demands. U. S. Steel funds
program amounted to $330,000,
Government financing the remai

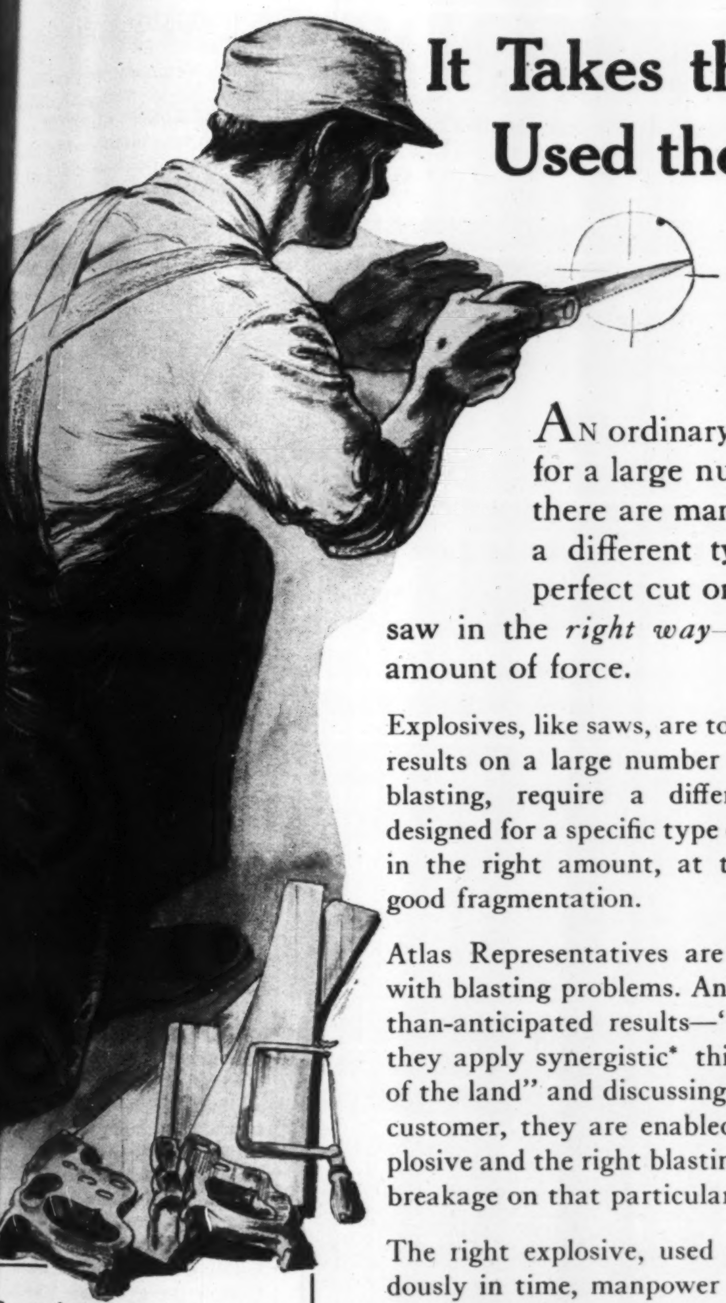
ACQUISITION of the Crown Spr
Manufacturing Co. of Los A
Calif., by the Kellogg Division
American Brake Shoe Co. ha
announced. H. O. Winkler,
dent of Crown Spray, become
president of the Kellogg Divis
charge of the Crown operation.
facture of the spray gun eq
will continue at the Los Angel
under Mr. Winkler's supervis

SONOCO PRODUCTS Co., Ha
S. C., was awarded the Army-
on Nov. 4, in a ceremony atte
nearly 2,000 employees. John
tin, general production manag
master of ceremonies, and the
nant was accepted by James L
president, from Col. C. W. Wo
of the Charlotte, N. C., Quarter
Depot, Sonoco, paper products
facturer, which makes Sonotubes
nated fiber tubes for concrete
among many other items, is al
ployed on precision metal work
nection with the war effort.

THE BROOKS EQUIPMENT & Mf
Knoxville, Tenn., recently ope
branch office and warehouse at
Cowart St., Chattanooga, Tenn.
business is sales and service fo
struction, industrial, quarry and
ing equipment.

ASHTABULA, OHIO, will be th
of a $3,360,000 malleable foundry
built for the Lake City Malleable
ings Co., Cleveland, according to
H. Redhead, president. Rust Eng
ing Co. of Pittsburgh is the en
and contractor, while the Defense
Corp. is financing the project.
Redhead said that the building
begin as soon as possible and w
completed by next May.

R. L. VANIMAN, who recent
signed as Director of the Auto
Division of the War Production
will become Vice President of the



It Takes the Right Saw Used the Right Way!

An ordinary crosscut saw can be used for a large number of sawing jobs. But there are many kinds of saws—each for a different type of job. You get the perfect cut only when you use the *right* saw in the *right way*—and apply just the right amount of force.

Explosives, like saws, are tools. Some explosives give good results on a large number of jobs. Other jobs, for good blasting, require a different explosive—an explosive designed for a specific type of shot. Use the *right* explosive in the right amount, at the right place—and you get good fragmentation.

Atlas Representatives are constantly aiding customers with blasting problems. And to give the customer better-than-anticipated results—"2 plus 2 equals 5" results—they apply synergistic* thinking. By analyzing the "lay of the land" and discussing ideas back and forth with the customer, they are enabled to recommend the right explosive and the right blasting formula for the best possible breakage on that particular job.

The right explosive, used the right way, saves tremendously in time, manpower and equipment use.

Have YOU a blasting problem you'd like us to tackle? Consult Atlas.

Synergism: ***The force that produces "2+2=5" results when both you d we get together and really "click."***

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"Everything for Blasting"

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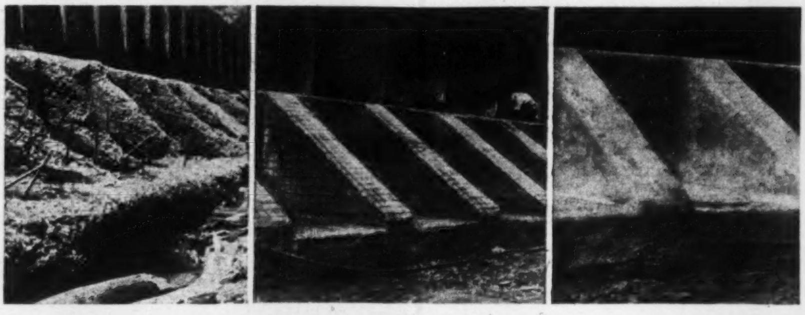
CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



A DAM REINTEGRATED WITH "GUNITE"

The first photo shows disintegrated buttresses of a dam at the hydro-electric dam of the Central New York Power Corp., Trenton Falls, N. Y. At middle is shown how our construction crew restored the buttresses close to the original lines, and the reinforcing mesh placed, preparatory to placing the "GUNITE" reintegration. The final view is of the job after 2" of "GUNITE" had been applied. This coating was carried down to the rock of the stream bed. After ten years, this work looks like newly done.

Our Bulletin 2200 describes similar jobs we have done, as well as hundreds of other uses of "GUNITE." Write for a copy.

MANUFACTURERS OF THE "CEMENT GUN"

Alert Contractors!
Buy the
JACKSON
Hydraulic
Concrete
Vibrator
for Dependable, Speedy Performance

[illegible]

- 34-ft. [illegible] head
- Adjustable frequency [illegible] 6800 R. P. M. [illegible] in concrete
- Powerful gas engine [illegible] H.P.
- Long-lived, [illegible] rotary, hydraulic [illegible]

THEY CAN "TAKE IT"
24 HOURS A DAY
7 DAYS A WEEK

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON, MICHIGAN

hauf Trailer Co. in charge of
on Jan. 1.

Mr. Vaniman was called fr
town, South Africa, to Washi
Deputy Chief of WPB's A
Branch one month after Pearl
He was appointed chief of the
in Aug. 1942.

Henry Wick has resigned
ager of operations of the
Steel Corp. Steel and Tubes
and will be succeeded by C. H.
Wick will become associate
Myron A. Wick as vice presi
Plastic Manufacturers, Inc., o
ford, Conn. Reinert joined S
Tubes in 1923 as foreman of
duit department of its Brookly
He was made superintendent
Cleveland plant in 1939. He w
charge of steel and tube opera
Brooklyn, Cleveland, Elyria a
troit.

Appointment of Thomas A.
as superintendent of the You
Sheet and Tube Co.'s Campbell
open hearth department to suc
E. Reinhard, who resigned to
Great Lakes Steel Co. as supe
ent of steel production, has b
nounced by A. S. Glossbrenner,
superintendent. He also announ
appointment of W. J. Reilly, as
intendent of the Brier Hill open
to succeed Cleary.

Globe Roofing Products Co.,
nounces that Earl M. Oren,
manager of Doremus & Co., advertising agency, has joined Globe's management staff. Because of his wide experience in handling national advertising accounts, as an editor and publisher, and as an advertis-
ing and merchandising director
building field, he will fit in well w
Globe's program of postwar d
ment.

Before assuming the managem
the Doremus Chicago office, Mr.
was editor and publisher of the
zine, "Building," a review of the
ing industry. Previously he was w
United States Gypsum Co., first a
licity manager and then as adv
manager, and before that was cit
of the Chicago Journal of Com

The Eighmy Equipment Co., fo
at 208 Blackhawk Building, Ro
Ill., distributors of construction
trial and material handling equi
has moved its sales office to 225

he MORETRENCH WELLPOINT System is used to predrain wet excavation on a wide variety of projects

FOR EXAMPLE, HERE ARE A FEW RECENT INSTALLATIONS

GASOLINE TANK FOUNDATIONS	KENOSHA, WIS.
NAVAL AMMUNITION DEPOT	MONMOUTH CO., N. J.
DRY DOCK BASIN	WILMINGTON, N. C.
SEWER CONSTRUCTION	NORFOLK, VA.
PIPE LINE RIVER CROSSINGS	OKLAHOMA AND KANSAS
POWER PLANT	PENSACOLA, FLA.
BUILDING FOUNDATION	STRATFORD, CONN.
OIL TANK FOUNDATIONS	NORFOLK, VA.
HOT METAL TUNNEL RECONSTRUCTION	INDIANA HARBOR, IND.
UNDERPINNING FOUNDATIONS	PASSAIC, N. J.
SEWAGE PUMP STATION	FLINT, MICH.
WATER PUMPING STATION	NEWARK, O.
WATER SUPPLY FOR SWIMMING POOL	PARAMUS, N. J.
CAISSON SHAFT	BALTIMORE, MD.

★

Whether your job is large or small, usual or unusual, we'll welcome the opportunity to help you—as long as it's WET! A-1 equipment, years of experience, trained personnel enable us to guarantee dry subgrades on every MORETRENCH job.

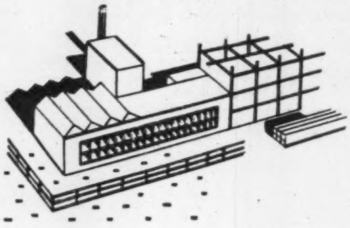
★

MORETRENCH CORPORATION

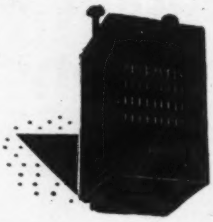
90 WEST STREET, NEW YORK 6

CAGO, ILL. **ROCKAWAY, N. J.** **NEW ORLEANS, LA.**

1. PLANT EXPANDS—OLD HEATING SYSTEM IS TOO SMALL



2. REZNOR UNIT HEATERS EASILY INSTALLED



3. RESULT—AMPLE HEAT WITH MINIMUM MAINTENANCE

4. SEND FOR CATALOG

● When you expand your plant or move into additional rooms in an existing building, it may not be economical to install new boilers and new piping . . . yet you must have heat.

With Reznor Unit Heaters, you do not need expensive equipment. Each heater is a self-contained package which can be placed quickly and easily where it will do the most good.

For large areas, you probably will need several heaters, but in small areas, one Reznor Heater usually is sufficient. Our salesman will be glad to give you his recommendations. Reznor Unit Heaters can be suspended or placed on the floor. Several different sizes are available to take care of all conditions.

Send for the catalog and make your choice.

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REZNOR MANUFACTURING CO., 105 JAMES ST., MERCER, PENNA

For Your Convenience

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TO

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Company.................................... Position....................................
Nature of Business.. ENR 4-20

Street, Rochelle, Ill. A larger b
has recently been purchased in R
to house the office and the machi
rebuilding shops. It is now able t
on crane and shovel, compressor,
pump, and crusher and other rebu
The company covers the norther
of Illinois and the southwest por
Wisconsin.

To prepare Allis-Chalmers Mf
for the postwar European m
Hardy B. Reisfeld has joined the company's general machinery export department in Milwaukee, it has been announced by William C. Johnson, general sales manager.

Reisfeld comes to Milwaukee from
St. Louis, Mo., where he was em
by S. C. Sachs, electrical contract
is prepared for his present posit
many years of representing ind
firms in Turkey, Sweden, the B
and Belgium. He came with his
to this country in 1940, when th
mans invaded Belgium.

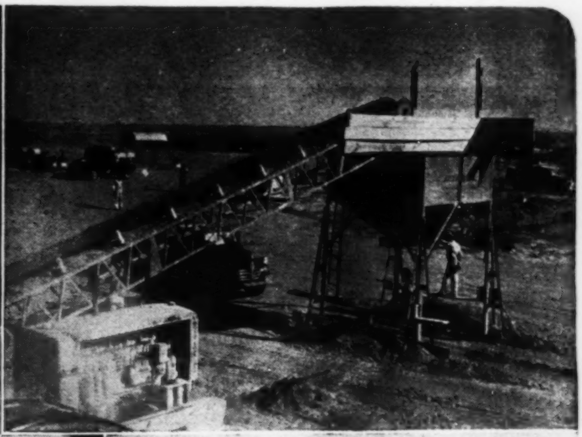
The Wailes-Dove-Hermiston C
new plant being constructed at Ho
Tex., to supply the needs for Bitu
Pipe Coating in the Southwest com
a cross country chain of manufac
facilities: Westfield, N. J.; Ea
Louis, Ill., and now at Houston. w
siding on the Houston Belt Te
Railway serves the property. Am
cilities will be available for l
trucks. It is near the Beaumon
other highways.

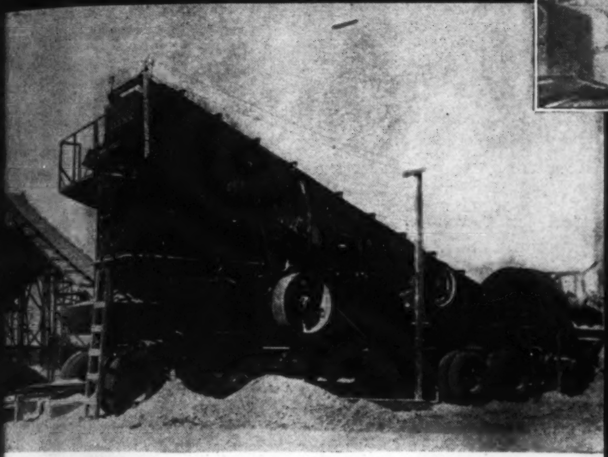
The Wickwire Spencer Steel Co
announces the appointment of
Allington as sales research en
with particular emphasis in the o
petroleum fields. Mr. Allington
to joining Wickwire Spencer, wa
trict manager of the Logan-Alli
Co., Inc., for twelve years. He ha
been associated as district sales ma
with the Sharpsville Boiler Works
Sharpsville, Pa., and sales manag
the Schlanger Divisions of Am
Machine and Metals, Inc., of New
and E. Moline, Ill. Mr. Allingto
be located at the company's exe
offices, 500 Fifth Avenue, New Y
New York.

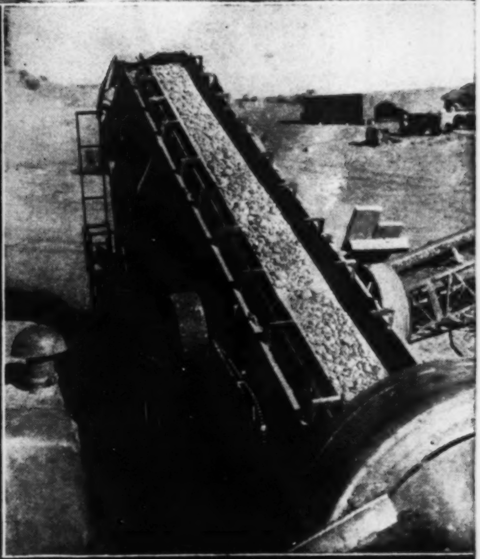
Lyman D. Warner has been app
sales manager of the Crocker-W
Division, Joshua Hendy Iron W
Ampere, N. J.

Mr. Warner has been assistant
manager since 1941 and active i
sale of motors, generators and fi

Over 500,000
Yards of
Gravel Per Year!







ccess stories of Universal plants are many. Typical is the e recently received from Cage Bros. & J. Floyd Malcolm, xas, gravel producers. They have given us the following port on their Universal Gravel Crushing, Screening and ading Plant:

Maximum yardage per hour: 400 yards of material 2" and under.

Average production in continuous operation: 275 yards per hour.

Average annual production: over 500,000 yards.

is compact portable plant consists of a 1036 primary jaw sher, 40"x 24" secondary roll crusher, 2½ deck 4'x 12' een, rotovator and conveyors—a lot of gravel produced th a minimum of equipment.

k any user of Universal equipment about production costs, el consumption, bearing life, maintenance costs and other erating factors. *When results are checked, Universal is the ice!*

UNIVERSAL ENGINEERING CORP.
633 C Avenue, West Cedar Rapids, Iowa

Get Behind the A.R.B.A.!

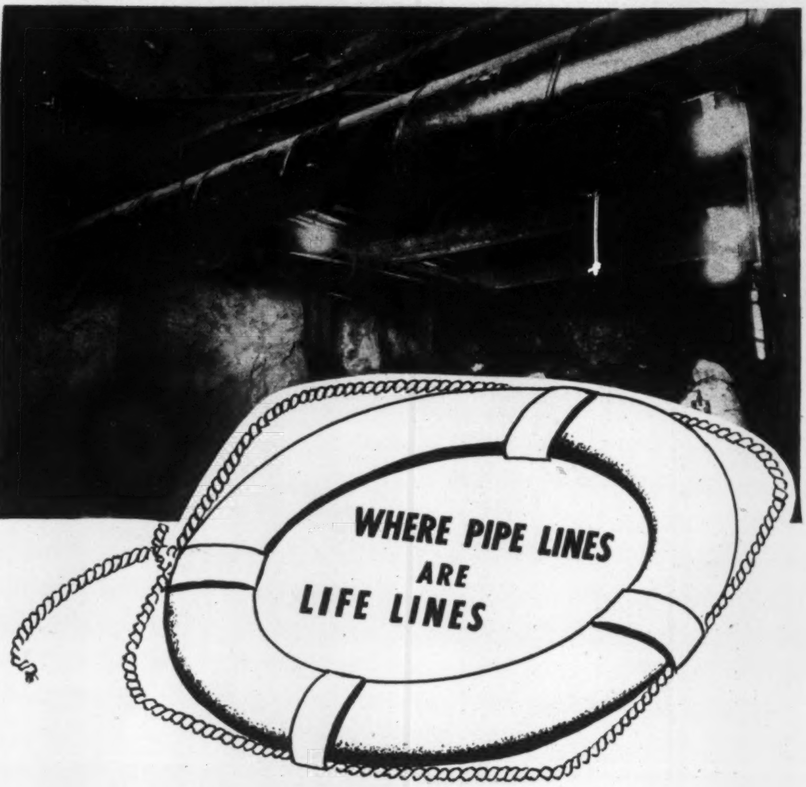
Officials of the American Road Builders' Association have issued a plea to members, affiliated organizations and other interested parties to launch a well integrated post-war highway building program at once so that the wheels can be set in motion immediately upon conclusion of the war.

A copy of "A Sound Plan," detailing the program to hedge against post-war deflation is available to those interested, from the A.R.B.A., 1319 F St. N. W., Washington, D. C.

ARMY E NAVY

UNIVERSAL

CRUSHERS. PULVERIZERS. COMPLETE PLANTS. SPREADEROLLERS. PORTABLE ASPHALT PLANTS



Specify NAYLOR *Light-weight* PIPE for *Dependable Ventilating Service*

Here's why it will pay you to use light-weight Naylor Pipe for push-pull ventilating service.

Naylor's exclusive Lockseam Spiralweld structure provides pipe that is always accurate in diameter . . . that is round and holds its true cylindrical form during transportation, installation and service. Ends always match correctly so that the line is tight and leak-proof.

The Lockseam Spiralweld creates a reinforcing truss which assures extra collapse strength and permits the use of Naylor Pipe on jobs that no other light-weight pipe can handle. The larger the diameter pipe required, the more this is true.

Economy is another factor. Contractors report that Naylor is the one pipe that can be used and re-used in ventilating service, thanks to the reinforced structure.

Important advancements in manufacture and assembly make Naylor Pipe even more effective in ventilating service for post-war requirements. Find out how you can benefit by Naylor performance on your next job that calls for ventilation.

Specify Naylor Pipe for Dredging
Hydraulic Sluicing • De-Watering
Ventilating • Exhaust and Intake
Gas Gathering • Pulp Lines • Vacuum
Lines and other high or low pressure lines.

Sizes from 4 to 30 inches in diameter . all types of fittings, connections and fabrication.

Naylor

NAYLOR PIPE COMPANY

1248 East 92nd St. • Chicago 19, Illinois

couplings for Crocker-Whee 1937. Earlier he was associ the Ingersoll Rand Co. and the Electric Co. in Schenectady, N and Chicago. He is a gradua high University.

Recently Announced as a ne for the Davey Compressor Co. Ohio, is the Wentz Equipm Topeka, Kan.; Wentz Equip as a franchise dealer, will hand portable and industrial com truck power take-offs and p saws. The company is distri road scrapers, snow plows, hal circle culverts and similar equi

Frank Burns has been made in the preparation and produ trade paper advertising, dire catalogs and sales promotion for the Euclid Road Machin Cleveland 17, Ohio.

Appointment of the Turbine ment Co., 75 West Street, N City, as exclusive representativ Yeomans products in the N metropolitan area has been an by Yeomans Brothers Co. of manufacturers of centrifugal rotary compressors and sewag ment equipment.

An organization of 35 years s Turbine Equipment Co. has serviced pumping equipment founding. President of the co Russell Klemm, one of the f Harold Sinclair and Donald F are vice presidents and Edwar is secretary-treasurer.

Francis A. Sparks, 74, died in Denver, Col. He was widely in the West in engineering circ ing been active for many years ciation work. He was engineer Public Service Co. of Colora many years until he retired thr ago.

Offices of Struck Constructi general contractors in charge o ing the Reynolds Metal Co. p Memphis, Tenn., have been mov the Sterick Building to the plan Raines Station.

George C. Clarke, civil engine was vice-president and treasure Fraser-Brace Engineering Co. real, Que., has moved perman New York where he now holds sition of second vice-preside treasurer of Fraser-Brace Co. I York.

Mr. Clarke has been wi company since 1911 when he b director and chief engineer. Pittsburgh, Pa., he received hi neering education at Pennsylvan College.

PAMLICO
OSGOOD
800

Dependable Globe-Trotter

OSGOOD SHOVELS and CRANES Go Where the Fighting and Digging are TOUGHEST

Headed for the fighting front are another 48 tons of cargo that will "dig down" and pay its own passage anywhere.

In Italy, on New Guinea and Guadalcanal, from Alaska to South America . . . in every part of the globe where our combat forces need roads and construction, Osgood Shovels and Cranes are helping to clear the way to Victory.

Rugged, dependable, easy to handle and maneuver because of Osgood measured air control, these shovels, pile drivers, drag lines and cranes are doing outstanding work in *all* kinds of going . . . from rubble to rock.

Soon, thanks in part to their performance in this country and abroad, Osgoods again will be available to the construction field. Until that day, keep your dependable Osgood in action with preventive maintenance!

BUY ANOTHER WAR BOND TODAY!

The
GENERAL
EXCAVATOR CO.
Sizes: ⅜ - ½ - ⅝ - ¾
DIESEL - GAS - ELECTRIC
Associated with
THE OSGOOD CO.

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HERCULES
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HERCULES
IRONEROLLERS
6 to 12 Tons
Diesel or Gasoline
Associated with
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OSGOOD MARION OHIO U.S.A. GENERAL HERCULES
SHOVELS
DRAGLINES - CRANES
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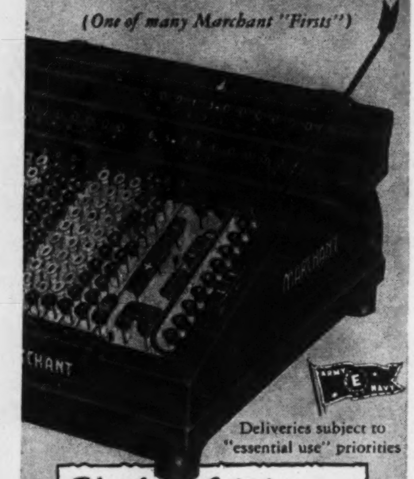
THE OSGOOD COMPANY, Marion, Ohio

MARCHANT
First
WITH
AUTOMATIC
MULTIPLICATION
(One of many Marchant "Firsts")



Deliveries subject to "essential use" priorities

The Art of Calculating as advanced by **MARCHANT**
Automatic Multiplication, first introduced among American calculators by Marchant, 20 years ago, was acclaimed the outstanding calculator achievement of its day.
In its present highly improved form, it brings the exceptional time savings mentioned below.

AUTOMATIC MULTIPLICATION in the Marchant of today multiplies 9358×3456 in 3½ seconds... which *includes* time for setting up amounts and clearing.

You merely enter the figures into keyboards as fast as you read them. The instant you enter the last figure the complete answer is before you . . . . with dial proof of all factors!

Automatic Multiplication is one of 20 Points of Superiority by which Marchant brings speed, accuracy, and good nature to all calculator work.

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SILENT-SPEED ELECTRIC
CALCULATORS
THIRTY-FOURTH YEAR

Marchant Calculating Machine Company
Home Office: Oakland 8, California, U. S. A.
SALES AGENCIES AND MANUFACTURER'S SERVICE STATIONS GIVE SERVICE EVERYWHERE

The Johnston & Jennings Co., Cleveland, Ohio, will operate the new detinning plant being erected at Boyles, a suburb of Birmingham, Ala., by the H. K. Ferguson Construction Co. The plant is located on a tract of 26 acres and will cost approximately $3,000,000. Its completion is expected this spring.

B. O. Bach, manager of contracts, fabricated steel construction, of Bethlehem Steel Co., has been appointed assistant general manager of sales.

He was graduated from Ohio State University in 1922 as a civil engineer. During the First World War he served 18 months in France with the 23rd U. S. Engineers.

He began work in the Steelton Bridge Shop in June, 1922, and was a foreman when he was transferred in 1924 to the order department in Bethlehem. In 1930 he became assistant to the manager of the fabricating department, and in 1931 he was appointed manager of orders, and in October, 1937, was transferred to the sales department as manager of contracts, fabricated steel construction.

W. E. Miles, industrial sales manager of The Cleveland Tractor Co., has rounded out 25 years of service to Cletrac and the tractor and construction industries. He was awarded Cletrac's 25-year service pin at an informal ceremony at Cleveland recently.

The company was less than four years old when young "Bill" Miles packed his army uniform in moth balls and sold himself into a job with Cletrac in January, 1919. He has held practically every sales position in the company. He served as a director of the American Road Builders' Association from 1938 to 1940 and is a member of the War Production Board Advisory Committee in Washington and of the Crawler Tractor Industry Integration Committee, coordinating efforts of the Military Services and the War Production Board.

James B. Clow & Sons, Chicago and National Cast Iron Pipe Division, Birmingham, Ala., announce the opening of a sales office at 2 Rector St., New York 6, N. Y. Henry E. Skibbe is manager.

Donald S. Klippert has been appointed assistant general manager of sales of the Timken Steel and Tube Division of The Timken Roller Bearing Co., Canton, Ohio. Klippert had been Cleveland district manager of the Timken Steel and Tube Division. Appointment of Robert P. Donnell to succeed Klippert as Cleveland district manager was made at the same time. Donnell has been a Timken engineer specializing in aircraft applications for the past six years.

Consider sensibly
your use of
Air Compressors

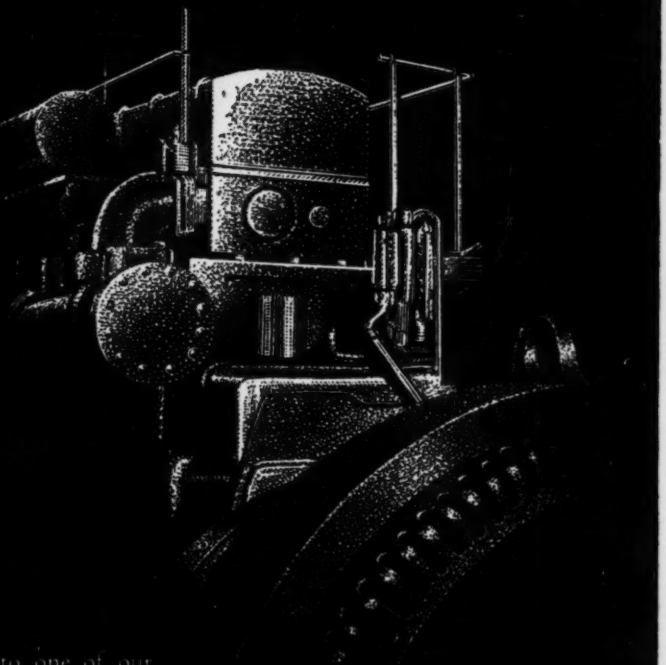
• How many operations do you have where costly, cumbersome compressors could be replaced with low-cost, flexible Smiths? How much time and money will you save with Smiths that are easily moved from one job to another and use only 1 gal. of gasoline an hour. *This thinking deserves your serious consideration.*

Smith Compressors are admirably equipped to give you all the power you need for most compressor work. Made with FORD Motors, standard parts and the famous Smith Compressor Head, they are sources of satisfaction to users everywhere. . . . Low initial cost, operating cost and maintenance. Capacity easily varied for different jobs. Repairs and parts available everywhere. Automatic unloading and idling; self-starter; no couplings, belts, clutches or gears to cause trouble.

May we tell you more about Smith Compressors? Wire, phone or write today!

GORDON
Smith
& CO. Incorporated
430 College St., Bowling Green,

EXAMPLE OF *Service*:

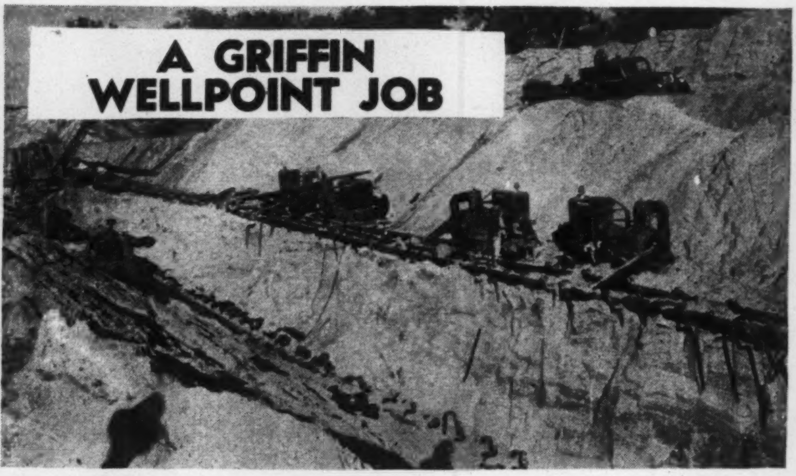


A large company put this problem to one of our Cities Service Diesel Lubrication Engineers: "How can we reduce Diesel breakdowns that are seriously interfering with production?" . . . Our engineer studied the facts and recommended a special Cities Service Diesel lubricant. In 38 months since, Diesel efficiency has been steadily maintained, with engine overhauls reduced by the amazing figure of 30%.

More and more, it's service that counts . . .

and *Cities Service* means good service!

CITIES SERVICE OILS
ONCE-ALWAYS
CITIES SERVICE OIL COMPANY
ARKANSAS FUEL OIL COMPANY



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DEEP OR SHALLOW
LONG OR SHORT RENTAL

We'll Tackle It Anywhere
and *DO IT RIGHT!*

FOR SALE AND FOR RENT
Call or write any of the Addresses below

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GRIFFIN WELLPOINT CORPORATION

5 Guides to *NEW BUSINESS* in the Construction Market

1—PROPOSED CONSTRUCTION FOR EARLY BIDS
2—BIDS ASKED DATE
3—LOW BIDDERS AND CONTRACTS AWARDED
4—PROPOSED POSTWAR CONSTRUCTION PROJECTS
5—POSTWAR PROJECTS IN DESIGN STAGE WITH ENGINEERS AND ARCHITECTS AT WORK ON SPECIFICATIONS

ALL CLASSES OF ENGINEERING CONSTRUCTION
projects, all over the country, reported in these 5 stages by
Engineering News-Record CONSTRUCTION DAILY 330 W. 42 St., New York 18, N. Y.

MEN AND JOBS

Arthur O. Tomek, former city
neer at Two Rivers, Wis., who has
connected with the office of chief
neer at Washington, D. C., has
appointed design engineer with
Washington suburban sanitary com
sion.

Jesse S. Allen, formerly a U
States Bureau of Public Roads eng
at Ogden, Utah, moved from one
treme to another in his transfer
the Alaska highway to the Pan-Am
can highway in Costa Rica. He
two years on construction in the no
His new headquarters will be San J
Costa Rica.

Harry W. Lochner, assistant
engineer of the Cook County high
department of Ill., has resigned to e
private practice as H. W. Lochner
Co., 160 N. La Salle St., Chicago 1.

Maj. George D. Burch, formerly
the military projects division of
Denison District Army Engineers
Denison, Tex., has been assigned
foreign duty.

Maj. F. O. Reeves, executive offi
Little Rock District, U. S. Engine
has been promoted to lieutenant colo
Born in Fulton, Ky., he went with
U. S. Engineers at Memphis, Tenn.
1937 and served as head of levee ope
tions and construction. He has
with the Little Rock office since J
1937.

Albin Gries is returning to his
position as chief landscape engineer
the Illinois division of highways. Si
January, 1943, he had been seco
lieutenant in the Anti-aircraft Artill
of the Army Eastern Defense Comma
until March 5.

Mason G. Lockwood, engineer,
been retained by Houston, Tex.,
appraise with a realtor, the value
port properties to be sold to the na
gation district.

William S. Orr has been appoint
city manager of Niagara Falls, O
He has been city clerk and engine

Casimir Stanislaus Czowski Roge
bridge engineer, Canadian Natio
Railroad, has retired. Mr. Rogers,
native of Niagara Falls, Ont., was gr
uated from Queen's University
joined the Canadian National in 19
He is succeeded by George Roy Do

"Just what I want, but...

WILL IT RUST?"

The customer is wise. He knows that the beauty of painted iron or steel may be only "skin deep," and that, unless the article is Hot Dip Galvanized, its attractive appearance and serviceability will soon be marred by the ugly stains of rust. From the viewpoint of customer, dealer, or manufacturer, it's false economy *not* to Hot Dip Galvanize iron or steel.

It's an accepted scientific fact that Hot Dip Galvanizing gives the *most* protection against rust per dollar of cost. Hot Dip Galvanizing deposits the *thickest possible coating of zinc permanently fused to the metal beneath*, thus providing a rust-free base for paint or other decorative finish.

When you *buy* articles of iron or steel, be sure to ask, "Is it *Hot Dip* Galvanized?" If you *make* articles of iron or steel, be sure of getting a genuine and expert job of *Hot Dip* Galvanizing by sending your materials to a member of this association. American Hot Dip Galvanizers Association, Inc., First National Bank Bldg., Pittsburgh, Pennsylvania.

"If it carries this seal
it's a job well done."

Buy from the qualified members listed below and KNOW you are getting a genuine HOT-DIP job.

CALIFORNIA
LOS ANGELES GALVANIZING CO., HUNTINGTON PARK
ATLAS GALVANIZING, INC., LOS ANGELES
EMSCO DERRICK & EQUIPMENT CO., LOS ANGELES
JOSLYN CO. OF CALIFORNIA, LOS ANGELES
WESTERN GALVANIZING COMPANY, LOS ANGELES
HUBBARD & CO., OAKLAND
JOHN FINN METAL WORKS, SAN FRANCISCO
SAN FRANCISCO GALVANIZING WORKS, SAN FRANCISCO
SUPERIOR PACIFIC GALVANIZING CO., LOS ANGELES
RHEEM MANUFACTURING CO., RICHMOND
INTERNATIONAL DERRICK & EQUIPMENT CO., TORRANCE

CONNECTICUT
WILCOX, CRITTENDEN & COMPANY, INC., MIDDLETOWN

GEORGIA
ATLANTIC STEEL CO., ATLANTA

ILLINOIS
EQUIPMENT STEEL PRODUCTS DIVISION OF UNION ASBESTOS AND RUBBER CO., BLUE ISLAND
JOSLYN MFG. & SUPPLY CO., CHICAGO
STANDARD GALVANIZING CO., CHICAGO

MAINE
THE THOMAS LAUGHLIN CO., PORTLAND

MARYLAND
SOUTHERN GALVANIZING COMPANY, BALTIMORE

MICHIGAN
RIVERSIDE FOUNDRY & GALVANIZING CO., KALAMAZOO

MINNESOTA
LEWIS BOLT & NUT CO., MINNEAPOLIS

MISSOURI
COLUMBIAN STEEL TANK CO., KANSAS CITY
MISSOURI ROLLING MILL CORP., ST. LOUIS

NEW JERSEY
DIAMOND EXPANSION BOLT CO., INC., GARWOOD
L. O. KOVEN & BROTHER, INC., JERSEY CITY
INDEPENDENT GALVANIZING COMPANY, NEWARK

NEW YORK
ACME STEEL & MALLEABLE IRON WORKS, BUFFALO
THOMAS GREGORY GALVANIZING WORKS, MASPETH, (N. Y. C.)
ATLANTIC STAMPING CO., ROCHESTER

OHIO
THE WITT CORNICE COMPANY, CINCINNATI
THE FANNER MFG. CO., CLEVELAND
THE NATIONAL TELEPHONE SUPPLY CO., CLEVELAND
INTERNATIONAL-STACEY CORP., COLUMBUS
THE CHARLES E. SCHULER ENGINEERING CO., NEWARK
COMMERCIAL METALS TREATING, INC., TOLEDO

OREGON
GALVANIZERS, PORTLAND

PENNSYLVANIA
LEHIGH STRUCTURAL STEEL CO., ALLENTOWN
AMERICAN TINNING & GALVANIZING CO., ERIE
PENN GALVANIZING CO., PHILADELPHIA
HANLON-GREGORY GALVANIZING CO., PITTSBURGH
OLIVER IRON & STEEL CORPORATION, PITTSBURGH

RHODE ISLAND
JAMES HILL MFG. CO., PROVIDENCE

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ISAACSON IRON WORKS, SEATTLE

WISCONSIN
ACME GALVANIZING, INC., MILWAUKEE

Not just Galvanizing but hot·dip GALVANIZING

Amsco Renewable Lip Dippers Helped Avert Future Johnstown Floods

Johnstown, Pennsylvania at last has real flood control, as one of the "blessings" of war. The valley in which Johnstown lies has been the scene of periodic inundations, most remembered of which is the disastrous flood of 1889 when a dam impounding an artificial lake burst, nearly sweeping the town out of existence. It is said that the water traveled down the valley at 180 miles per hour. Since then, flash floods have often taken toll of property in this valley.

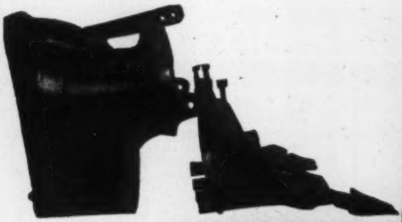
A number of war production plants are located in Johnstown, and uncontrolled floods might seriously hamper output. To avert damage, Stony Creek was widened and deepened, and paved slopes and concrete retaining walls were built in sections of it through the city. A total of 615,000 cubic yards of excavation was handled, much of it sand and gravel and the remainder blue laminated shale blasted from the channel bed and sides.

The excavation was done with three power shovels fitted with Amsco renewable lip dippers of the type shown in pictures R-485 and R-701. Spoil was loaded into trucks and hauled to a nearby ravine, which was filled to a depth of 60 ft. for a 3,000 ft. stretch.

Amsco renewable lip dippers were used on this and many other construction jobs so that when the lips—which receive the brunt of the wear—finally wore down beyond practical use, they could be quickly replaced. Internal "U"-bolts at each side tightly fasten the lip to the back casting, and lugs on the bottom edge of the lip fit and are fastened into corresponding slots in the front casting.

Made of manganese steel, "the toughest steel known," throughout, Amsco dippers afford maximum resistance to impact, abrasion and digging stresses—highly important where shot rock, tough shales or cemented gravels are being dug.

The evolution of the widely favored Amsco renewable lip dipper of today is described in Bulletin 641-D.



R 485

How Amsco Conservation Welding Rods Save — Bulletin 941-W.

Amsco

AMERICAN MANGANESE STEEL DIVISION

Chicago Heights, Illinois

AMERICAN Brake Shoe COMPANY

FOUNDRIES AT CHICAGO HEIGHTS, ILL.; NEW CASTLE, DEL.; DENVER, COLO.; OAKLAND, CALIF.; LOS ANGELES, CALIF.; ST. LOUIS, MO.
OFFICES IN PRINCIPAL CITIES

New Glasglow, N. S., with headqua
ters at Moncton, N. B.

Edward D. Soady, of Asheboro, N. C
a student in civil engineering at Nor
Carolina State College at Raleigh pri
to entering the Army last May, ha
been graduated from the officer cand
date school at Fort Belvoir, Va., an
has been commissioned a second lie
tenant in the Army Corps of Engineer

William B. Nicol has been appointe
chief engineer of the Hamilton Brid
Co., Ltd., Hamilton, Ont. A native
Scotland, Mr. Nicol is a graduate
the Herriot Watt College in Edinburg
He came to Canada in 1928 and serve
for some years with the structural div
sion of Canadian Vickers, Ltd. Joinin
the Hamilton Bridge in 1937, he ros
to assistant chief engineer in 1942.

Two engineers on the Northwest sta
of the Bureau of Reclamation hav
resigned recently. They are **Charles E**
Crownover, construction engineer o
the Rosa division of the Yakima projec
in Washington, and **John A. Beemer**
construction engineer in charge o
building Anderson Ranch Dam of th
Boise project in Idaho. The former ha
served with the bureau 35 years, an
the latter 11 years.

In a recent announcement of change
in the engineering personnel of the Ne
York Central railroad system, throug
error a line was omitted. The correctio
is that R. R. Smith, division engineer
N. Y. C. Line West at Toledo, Ohio,
the new assistant, district engineer a
Cleveland. C. R. Strattman, divisio
engineer, Michigan Central R. R., Jack
son, Mich., succeeds Mr. Smith as divi
sion engineer at Toledo.

Thomas W. Fluhr, formerly with th
Board of Water Supply and consultan
to the New York City Tunnel Authority
has opened an office in the city fo
geological investigations and reports fo
engineering projects.

Geo. E. Strehan has resigned as chie
consultant of the Project Processin
Division of the War Production Boar
and returned to private practice as en
gineer and architect at Leonia, N. J.

William H. Cheney of Salt Lake Cit
and Artesia, N. M., has been appointe
director of Region 7 of the Feder
Works Agency, with headquarters a
Berkeley, Calif., succeeding Rex L
Nicholson, who has resigned to retur
to private business. Region 7 embrace
Arizona, California, Colorado, Idah
Montana, Nevada, Oregon, Utah, Wash
ington, and Wyoming. Mr. Cheney at
tended the University of Wyoming, an

NOW IN PRODUCTION..

ew Mack Trucks for Civilian Pool:

Because of urgent and mounting essential civilian needs, the War Production Board has authorized the manufacture of certain types of trucks for commercial use

Assigned to Mack are models ranging from 9,000 pounds gross vehicle weight up to the largest off-highway vehicle. Production on some models has already started.

Military production continues, of course, in all Mack plants.

We will gladly give you detailed information. Just drop us a line, or phone.

Mack Trucks, Inc., Empire State Building, New York, N. Y.
Factories at Allentown, Pa.; Plainfield, N. J.;
New Brunswick, N. J. Factory branches and dealers
in all principal cities for service and parts.

YOU'VE GOT A MACK, YOU'RE LUCKY...
YOU PLAN TO GET ONE, YOU'RE WISE!

Mack

TRUCKS
FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS
BUY U. S. WAR BONDS

HERE'S WHAT TO DO BEFORE THIS HAPPENS

"WHO MAKES THAT KIND OF FITTING?"
"I THINK X MAKES IT"
"BILL KNOWS, BUT HE IS OUT OF TOWN"
"Y MAKES SOMETHING LIKE IT!"
Send For These Bulletins

HYDRAULIC JACKS
HAND PUMPS

FORGED STEEL FITTINGS

Forged Steel Screw End and Socket Welding Pipe Fittings are made by Watson-Stillman in a full line of Elbows, Tees, Crosses, Laterals, Couplings, Reducers, Bushings, Caps, Plugs and Unions for standard or extra heavy pipe lines. All W-S Fittings have uniform wall thickness, maximum wall strength and uniform material characteristics specified and controlled by W-S Engineers. Ask for Bulletin A-3.

VALVES

For use on standard and extra heavy pipe lines, Watson-Stillman supplies bronze or forged steel Globe Valves, Stop Valves, Angle Valves, Needle Valves and Check Valves of standard types in a wide range of sizes, for screwed, socket welding and flanged connections. Ask for Bulletin A-4.

HYDRAULIC JACKS

Watson-Stillman builds standard hydraulic jacks in Independent Pump, Vertical Outside Pump, and Horizontal Outside Pump types. Capacities of 10 to 500 tons. Used by shipyards, contractors, builders, drydock and wrecking companies, machine shops and oil drillers. Ask for Bulletin 710-A.

HAND PUMPS

For operating jacks, small hydraulic tools, and general testing purposes, Watson-Stillman manufactures Single Plunger and Double Plunger Hand Pumps with large, medium and small tanks. Ask for Bulletin 240-A.

WIRE ROPE SHEARS

On all sorts of construction and maintenance jobs, Watson-Stillman Wire Rope Shears are time-saving equipment. Also suitable for cutting iron bars and rods. Ask for Bulletin 740-A.

WATSON-STILLMAN
DISTRIBUTOR PRODUCTS DIVISION

For quality at no extra cost specify Watson-Stillman when you buy fittings, valves, jacks, pumps and shears.
The Watson-Stillman Co., Roselle, N. J.

Designers and Manufacturers of Forged Steel Fittings, Valves, and Hydraulic Equipment

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15 to 50 TONS CAPACITY

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The OHIO LOCOMOTIVE CRANE CO.
BUCYRUS OHIO

practiced engineering and geolog the west.

Assignment of **Lt. Col. James** chief, supply division, Seattle Eng District, to succeed Lt. Col. Ernes Riley, who has been transferred to Pacific Engineer Division headquar was announced recently by Col. Co P. Hardy, Seattle District Engineer. his new assignment, Col. Riley will the office which directs all eng activities for the Los Angeles, San F cisco, Sacramento, Portland and Se Districts, as well as the Alaska Pacific war theaters. Prior to change, he had headed military su for the Seattle Engineers since 1942. Col. Wild has been serving Seattle District as Operations and tracting Officer since last Novem

Col. Stuart M. Weaver was advan in rank on March 9 from a lieuten colonel rating. His elevation in followed closely on his appointmen the post of chief of the Repairs Utilities Branch of the Corps of E neers. Colonel Weaver has been leave of absence from the town of M clair, N. J., where he is director public works, since May, 1942.

Maj. Gen. George C. Dunham advanced from the rank of briga general on March 8. General Dun is assigned to the Office of the Coord tor of Inter-American Affairs, wher directs health and sanitation activ in Latin America, as well as serving assistant coordinator in connection other programs.

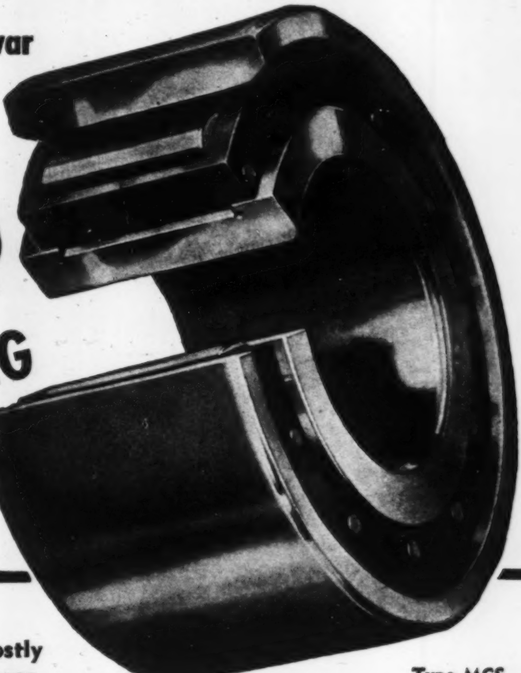
George Dansereau, Argenteuil, has been named Minister of Roads Public Works for the Province of bec, replacing J. D. Bouchard, na to the Senate at Ottawa.

Ford W. Harris has been appoi engineer of the Union Water Power Lewiston, Me., succeeding the late L. Bean. Mr. Harris was gradu from Rensselaer Polytechnic Insti and in 1924 entered the employ of Central Maine Power Co., in connec with the construction of the Gulf Is hydro plant on the Androscoggin Ri Lewiston. Lately he has been a mem of the engineering department of sco Services, Inc., Augusta, with w Central Maine Power is affiliated.

John L. Collins, of the engineer staff of Central Maine Power Co., gusta, Me., has been elected vice-p dent of the Maine Association of E neers. Mr. Collins was connected the construction of hydro plant fa ties for the above company, and t

An Important First-Step Toward Postwar PREVENTIVE MAINTENANCE . . .

Simplify ALL Bearing Loads with ROLLWAY RIGHT-ANGLED LOADING



Type MCS
Double Width

PREVENTIVE MAINTENANCE rather than costly repair or replacement will be the rule after the war. In more and more plants . . . on more and more drafting boards . . . ROLLWAY Solid Cylindrical ROLLER BEARINGS will get the nod. That's because Rollway Bearings are always loaded the right-angle way, reducing every load to the magnitude and direction of a single component—either pure radial or pure thrust.

LOOK at these FACTS!

When load magnitudes go down, higher bearing load capacity, faster operating speed or longer life-expectancy results. Proportionate combinations of all three advantages are possible. The big point is that load pressures per bearing are reduced, lubrication films are maintained and elastic limits of metals are never exceeded due to piling up of compound loads. With the load always carried at right angles to the roller axis, there is no tendency for rollers to wedge or pinch out, hence rubbing friction and roller-end wear-back are reduced. Machine stoppages for bearing replacements or service are less frequent. Manufacturing costs are lower.

RADIAL
THRUST

Follow This Basic Bearing Principle:—

- **All radial loads carried at right angles to the roller axis.**
- **All thrust loads carried at right angles to the roller axis.**
- **All compound loads carried on separate radial and thrust bearings—used in combination — as shown in the diagram.**

● A wide range of Rollway types in SAE and American Standard Metric Sizes are available for most requirements, eliminating the cost and delay of special tools, patterns and set-ups. Ask for a free Rollway bearing analysis and recommendation. Just send drawings or detailed description. No obligation.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 **BEARINGS**

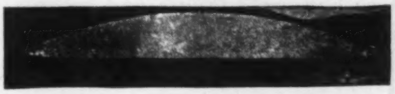
Watch Your Equipment GET UP and GO!

Change your stationary machines to mobile units for extra efficiency and extra value to users. Many manufacturers have found that their products really start GOING PLACES when they start them ROLLING!

EWC Wheels and Mountings can help work wonders for you. Write for Illustrated Bulletins --and sound engineering advice based on over 90 years of experience. » «

EWC WHEELS

Electric Wheel Co., Dept. NR Quincy, Ill.



THE PRELOAD REG. U. S. PAT. OFF. SYSTEM

Crackless Concrete Construction

THE patented Preload system of tank construction permits substantial economy in steel and concrete, with consequent savings in cost. Under the Preload system the concrete is permanently maintained in horizontal and vertical compression, thereby completely eliminating cracking or leakage.
Included among the 500 Preload tanks in service are the largest concrete surface tank, largest concrete standpipe, and largest self-supporting concrete dome.

DESIGNERS and BUILDERS of PRELOAD TANKS, ELEVATED TANKS, STANDPIPES, DOMES, PRESSURE VESSELS and CONTAINERS, and CARRIERS of LIQUIDS and DRY CHEMICALS

THE PRELOAD COMPANY
420 LEXINGTON AVE. ★ NEW YORK, N. Y.
Boston Montreal
Washington Toronto

subsequent operation, prior to his p
ent work in charge of distribution e
neering and continuing property
counts.

B. J. Finch, district engineer, Og
Utah, for the U. S. Public Roads
ministration for the past 25 years,
announced his retirement June 1.
cause of accrued annual leave, howe
he left the position in mid-March
L. M. Higgins, senior highway bri
engineer, is in charge of the dis
until Mr. Finch's successor is nam
Mr. Finch has had supervision of
Mt. Carmel tunnel in Zion Natio
Park, the Wendover road across the
flats, and development of the in
mountain highway system.

Appointment of **Edgar W. B**
formerly of the Ohio River division
the U. S. Army Engineers as sa
director at Lockbourne Air base,
Columbus, Ohio, has been announ
by Col. John S. Gullet, command
officer. Mr. Brill will have charge
the safety and accident prevention
gram at the base.

J. F. Pringle, vice president
general manager of the Atlantic Reg
Canadian National Railways, at Mo
ton, N. B., and a graduate engin
has been appointed vice president
general manager of the Central Re
of the C. N. R. system, headquar
Toronto. He succeeds F. L. C. B
also a graduate engineer, who rose
his present position through the e
neering department of the railways
who is retiring after 45 years servic

Capt. Oliver C. Anderson, form
a Dallas division engineer of the Te
State Highway Department, has b
made a major in the Army Air C
overseas.

Mayor Aloys P. Kaufman, of
Louis, Mo., has named Public Util
Director **Milton M. Kinsey** to the
of president of the Board of Pu
Service, to succeed Charles H. Ell
resigned. Water Commissioner **Tho**
J. Skinker was advanced to directo
public utilities, while Elton E. Ea
day, division engineer of the distr
tion section, water department, mo
up to the post of acting water c
missioner.

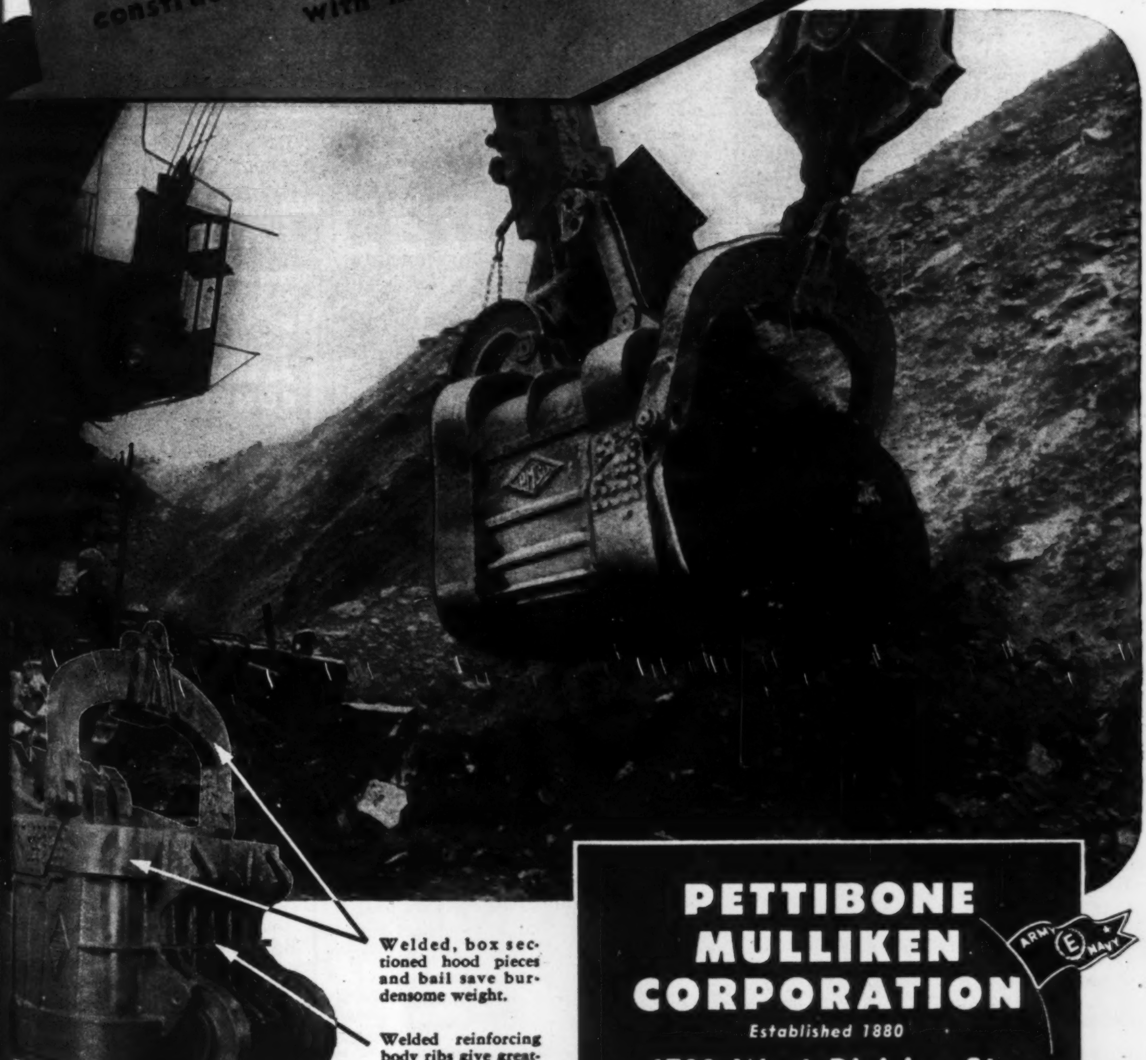
I. C. Steele, formerly chief of
division of civil engineering of the
cific Gas and Electric Co., has b
appointed chief engineer of the c
pany, and past-president **Walter D**
has been promoted to Mr. Ste
former position.

Lieut. Lester W. Bray, former

COAL STRIPPING with this 12½ yd.

PMCD WELDED DIPPER

reaches a high degree of efficiency because the welded construction of the dipper permits maximum strength with minimum dipper weight.



Welded, box sectioned hood pieces and bail save burdensome weight.

Welded reinforcing body ribs give greater strength with less weight.

We operate the largest and most complete manganese steel foundry in the United States.

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OPEN STEEL FLOORING AND STAIR TREADS

New Ideas for
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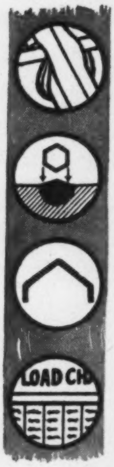
"The best guide in the industry for open steel flooring construction." That's what hundreds of plant managers and superintendents call the new BATES • GRATES illustrated catalog. It's particularly valuable now for making necessary structural changes. And, it gives you vital information on how to improve plant design.

WHAT THIS BOOK TELLS YOU



How to increase the strength and load-carrying ability of your steel treads and flooring.

How to make your steel flooring safer—free from grease, water and other slip-encouragers.

How to ease your floor and stair tread maintenance problems by eliminating hazardous, grease-catching structures.

How to determine the exact safe loads for open steel flooring—by using the handy BATES chart.

. . . and many other important facts for construction planning now and after the war. Be sure to send for your copy of the new BATES • GRATES catalog today.

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WALTER BATES COMPANY, INC.
JOLIET • ILLINOIS
OPEN STEEL FLOORING • STAIR TREADS

sistant resident area engineer at Camp Butner, N. C., has been named resident area engineer to succeed **Major Ray Warren,** who has been transferred to another post.

W. C. Kanoy, resident engineer, Div. 5, Greensboro, N. C., for the N. C. State Highway and Public Works Commission, has resigned after many years service, to become post engineer at Basic Training Center, No. 10, Army Air Force, Greensboro, N. C.

C. Frank Johnson's engagement as chief engineer of the Commissioners of Sewerage of Louisville, Ky., has been terminated by the completion of the work and the dissolution of the commission. Mr. Johnson has joined the staff of Metcalf & Eddy, engineers, of Boston, Mass., for whom his first assignment is at Honolulu, T. H., on a study of the sewerage problem there.

The following changes are announced by the Department of Public Works of Canada: **Bruno Grandmont** has been transferred from Rimouski to Quebec City as district engineer. **L. G. Trudeau** has been transferred from Quebec City to district engineer at Ottawa, Ont. **Leo McLaren** has been appointed acting district engineer at Rimouski, pending a permanent appointment.

F. W. Sarvis, who has been with the U. S. Public Health Service on malaria control work at Sikeston, Mo., has been named county engineer of Marshall County, Ia. He has served as county engineer in Shelby, Audubon, and Union counties, Ia. Sarvis replaces **George Henningsen,** who has joined the sales department of the Gibbs-Cook Tractor & Equipment Co., Des Moines.

A. H. Cunningham, Storm Lake, Ia., who has been on leave of absence to work on the Alaska Highway, has been reappointed county engineer of Buena Vista County, Ia.

D. L. Carmody, manager of the Orland, Calif., reclamation project, has been transferred to Riverton, Wyo., where he will succeed R. C. E. Weber as manager of the project in that region. Mr. Weber has been transferred to Arizona.

Edward D. Connor, formerly training supervisor for the War Manpower Commission in Chicago, has been chosen executive director of the Citizens Housing and Planning Commission of Detroit, Mich. The postwar program for Detroit comprises the development of the waterfront, rehabilitation of the boulevard area, slum clearance, adequate housing and community facilities.

KEEP YOU
CONVEYOR
BELTS GOIN

FLEXCO H D RIP PLATES are used in repairing rips and patching conveyor belts. Their use saves expensive replacements and extended shutdowns.

FLEXCO H D BELT FASTENERS make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

● Avoid shutdowns lengthen the life of conveyor belts and elevator belts by Flexco belt fasteners. sands of companies stepped up the ance of conveyor lines cut costs by using methods.

Bulletin F-100 shows actly how to make tight joints in conveyor with Flexco. Also illustrates step by step the latest practice in repairing rips and putting in patches.

Write your

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4656 Lexington St., Chicago

FLEXCO HD BELT FASTENE

Sold by supply houses everywhere

ARMSTRON
CONSTRUCTION TOOL

ARMSTRONG
DROP FORGED
CONSTRUCTION RATCHE

The ARMSTRONG Reversible Ratchet Con Wrenches are made of steel thruout—the are drop forged, the Nut Socket machined from analysis bar steel. All parts except the hardened. The spindle of the Ratchet is of "wide design—permits bolt to pass thru the Ratchet nuts can be run any distance along bolt and set with one setting. 24" or 36" Ratchets take or hexagonal sockets for nuts of from 1" to 2⅝"
1⅝" to 3⅛" dia., respectively.
Write for Catalog

ARMSTRONG BROS TOOL
"The Tool Holder People"
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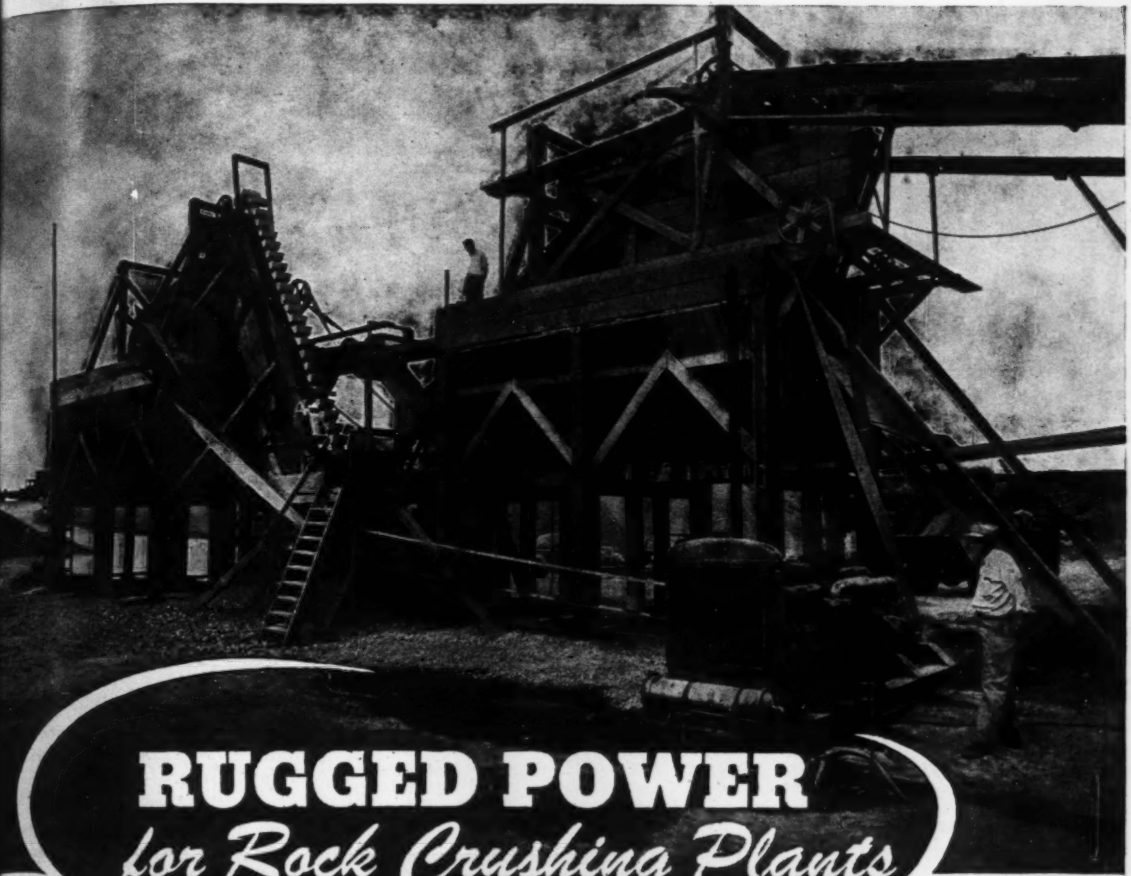

RUGGED POWER
for Rock Crushing Plants

Model ME-650 Murphy Diesel 200 HP industrial power unit driving machinery in rock-crushing plant at Portland, Ore.

WHEREVER heavy-duty power is needed for operating construction machinery, processing materials, or other industrial power, Murphy Diesel engines can be relied upon for dependable, economical, long-life service.

Their ruggedness, simplicity and ready adaptability to a wide range of equipment, assure ideal power performance . . . and their reputation for economy in operation and maintenance is world-wide. They are compact and relatively light in weight . . . easily portable . . . properly engineered for stationary installations.

They start easily and perform successfully on standard grades of Diesel fuel . . . premium-priced fuels are not required, and Diesel specialists are not needed to operate these practical Murphy Diesel power plants. *Write for bulletin.*

MURPHY DIESEL COMPANY

5311 West Burnham Street
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BUY U.S. WAR BONDS

More Power

MURPHY DIESEL
Reg. U.S. Pat. Off.

More Profit

Engines: FROM 90 to 215 HP
Generators: FROM 60 to 115 KW

"FIELD-PROVEN POWER"

STANG or STALLED?

Above — STANG excavation "in the dry". Note how slope of banks eliminates sheeting, bracing. Sub-grade of trench 13' below water level; STANG Wellpoint System predrained this area, lowered water level 2' below sub-grade.

Stang Engineering makes the difference!

Do you want to work a DRY Job—or do you want your men, machines, job and money STALLED by mud and muck? Look at the photo above! STANG Wellpoints not only predrained the soil but kept it dry and firm, needing no sheeting. Note the header located well to the side, where it didn't interfere with the excavating machine. STANG does a complete job for you—from pre-testing soil to proper planning and layout and installation to insure fastest, smoothest work at lowest cost. Don't get STALLED—get STANG!

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Hayward Buckets

Use this Class "E" Clam Shell Bucket for handling crushed stone, gravel, sand and other bulk materials.
THE HAYWARD CO., 48-50 Church St., N. Y.

It's easier to lift, lower, push or pull the Simplex Way!

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

for every construction purpose
Awarded the Gold Medal for Safety
Ask for Catalog 44
Templeton, Kenly & Co., Chicago 44, Ill.

NEW TRADE PUBLICATIONS

Weld Inspection Chart—A new and comprehensive arc welding inspection chart enabling operators and inspectors to tell at a glance whether welds are being properly made, has just been published. It pictures various results obtained in making fillet and butt welds and describes the characteristics of proper and improper weld beads, with a description of the conditions under which each was made.

The chart should prove helpful to everyone interested in speeding up arc welding production. It is printed in two colors on a heavy grade stock measuring 23 inches by 35 inches, and i available without charge to inspectors, operators and others concerned with welding.—*The Lincoln Electric Co., Cleveland, Ohio.*

Testing Laboratories—Much has bee written about the part chemists, scien tists, physicists, and testing laboratories will play in the post-war world. Manu facturers are thinking ahead, planning on the use of research and testing i the solution of their problems. How bes to put to use the vast knowledge store in the minds and files of research an testing engineers causes manufacturers to ask "What can the testing laborator do for us?" This is answered in a book let which is well worth reading.—*The United States Testing Co., Inc., Hobo ken, N. J.*

Stellite Tools — Through drawings, photographs, and charts, an 8-page booklet explains the cutting angles speeds and feeds, chip-breaker grind and grinding wheels recommended fo use with stellite turning and boring tools and milling cutter blades. Recom mendations are made for machining number of different metals and alloys. A chart listing the grinding wheel recommended by 13 different manufac turers is also given as a guide to select ing grade and grain for grinding opera tions.—*Haynes Stellite Co., Kokomo Ind.*

Handling Equipment—A second sec tion of a new industrial handling equip ment catalog has just been issued. I includes a description of a new mode automatic dump hopper mounted o casters, four models of heavy dut

STREAMLINE COPPER SERVICE PIPE
STREAMLINE SOLDER TYPE FITTINGS
AN UNBEATABLE PAIR...
...for water service connections
vibration-proof..leak-proof..rust-proof

municipalities throughout the country are making post-war plans for improvements or ions in their water systems. STREAMLINE copipe connected with STREAMLINE solder type fitprovides the most practical installation for water e lines . . . for all general plumbing and heating ses, and for many applications in filtration plants.

together, STREAMLINE copper pipe and STREAMLINE r fittings are an unbeatable pair.

AMLINE copper pipe when assembled in the STREAMLINE rests upon an internal shoulder of practically the same t as the thickness of the pipe wall, thus forming a continusmooth waterway which offers no anchorage points for the ng up of foreign matter in the water.

VIBRATION PROOF

AMLINE copper pipe connected with STREAMLINE solder fittings is rom the harmful effects of vibration. Vibration is not localized at the as it is with threaded or flared fittings, but is harmlessly dissipated ghout the service line.

SETTLEMENT AND FROST ACTION

AMLINE copper service pipe is so ductile that it will stretch enough to easily care of any settlement of filled earth, or, in fact, anything that might impose a strain on the service line which would cause failure of rigid ferrous pipe or, at the very least, cause leakage at the threaded connections.

In the Northern States and in the Dominion of Canada, copper service pipe of our manufacture has an outstanding advantage that places it far in advance of any other service material. This advantage is its resistance to frost action. This service pipe containing water under almost any range of pressure used in water service work can be alternately frozen and thawed out for a considerable number of times without showing any effect except a slight increase in diameter.

INVESTMENT INSURANCE

STREAMLINE copper pipe and fittings are at present being used 100% for war purposes in naval craft of practically all kinds, but it is not too early to plan again for their peacetime use. Waterworks officials who are responsible for the return on a heavy capital investment will find STREAMLINE materials one of the lowest cost forms of insurance that they can adopt.

STREAMLINE
PIPE AND FITTINGS DIVISION
MUELLER BRASS CO.
PORT HURON, MICHIGAN

IT'S NOT SO EASY—
BUT EVEN IN THE DESERT, WITH THE HELP OF HERCULES CARGO BODIES, THE ARMY REPAIRS ITS EQUIPMENT

HOW MUCH EASIER IT IS FOR YOU TO KEEP YOUR EQUIPMENT IN REPAIR!

Don't neglect your Hercules Hydraulic Hoists and Bodies, or your Hercules Split-Shaft Power Take-offs. Quick service on all Hercules parts is always maintained, and there's a Hercules Distributor with a well equipped Service Department near you.

Hercules Steel Products Co.
GALION, OHIO

BAILEY METERS AND CONTROLLERS

FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

● Venturi Tubes, Weirs, Flumes, Nozzles and other primary elements; Mechanically and Electrically operated Registers and Complete Automatic Control Systems.

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Bailey Meter Co. Ltd., Montreal, Canada

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PRESSURE CONCRETE CO.
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NEWARK, N. J.

(wagon type) trucks, sixteen misce
neous models of steel boxes, bask
and platform skids, trucks, trailers a
four models of specific purpose truc
This with the 8-page popular mo
truck, trailer, truck and caster secti
distributed a year ago, provides a co
prehensive file on this kind of mate
handling equipment.—*Rose Manu
turing Co., 12400 Strathmore, Detr
Mich.*

Tractor Shovels—An attractive
page folder describes a tractor sh
said to be ideal for material hand
or construction work at airports, a
camps, ordnance plants and for pu
utilities, municipalities, highways
all commercial plants where bulk ma
ials must be loaded, moved or hand
on a production basis. Many of
jobs it is designed to do are illustra
in the folder.—*The Frank G. Ho
Co., Libertyville, Ill.*

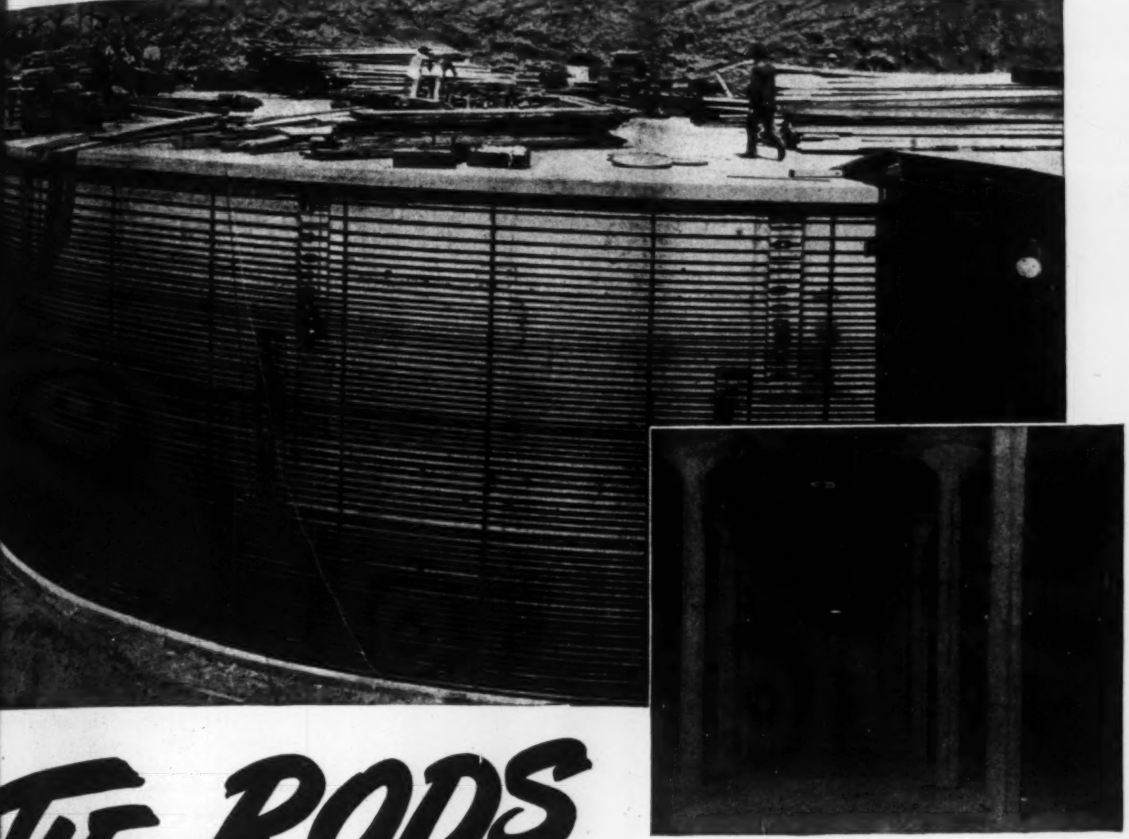
Lumber Data Book—"Lumber
dustry Facts" (1943 edition) has
been released. The book presents
portant information on forest industr
determination of sound public pol
and provision within the forest produ
industries of dependable sources
business and employment.

This is the third biennial edition
this data book. It contains 78 stati
cal tables and 23 charts. The table
contents covers six major subdivisio
Raw Material—The Forest, Lum
and Timber Products, Lumber Prod
tion, Lumber Shipments, Lumber C
sumption, and Pulpwood, Pulp,
Paper. A complete cross index ma
information readily findable.—*Sta
tical Division, National Lumber Ma
facturers Association, 1319 18th
N. W., Washington 6, D. C.*

Flow Meter Engineering—This
page booklet tells why, when and w
flow meters and instruments are nee
in the modern plant, and how they
be made to further the war effort.
considerable amount of basic meter
data is covered, being arranged in
facing pages for convenient use.
pages of drawings are devoted to
tails of proper installation meth
The reprint also includes helpful h
for keeping instruments out of
repair shop.—*Cochrane Corpora
17th & Allegheny Ave., Philadelp
32, Pa.*

Care of Chain Belt Drives—"W
time Care of Chain Belt Drives"
booklet just published by the Chain
Co. giving information on maintena
lubrication and repair of chain
drives during these wartime days.

Chain belt drives, as well as
equipment, are working longer h



Inside view of underground storage tank.

TIE RODS

... for Navy storage tanks

To save critical steel plates, the Navy is storing large quantities of fuel in underground concrete tanks ranging in capacity up to 50,000 barrels.

Threaded steel rods connected by turnbuckles are placed around these tanks and tightened, thereby placing the concrete wall under an initial compression of such magnitude that no tension can occur when the tank is full.

The rods must therefore be strong enough to withstand the initial tension necessary for prestressing of the concrete, plus the additional tension which results from the pressure of the fuel.

Bethlehem has supplied many tons of rods for these storage tanks. Made from selected steel with yield points of 45,000, 50,000 and 60,000 pounds per square inch, the rods have plenty of strength to withstand the high stresses they encounter when the tanks are filled.

This is one of hundreds of special fastenings problems that are currently being put up to Bethlehem. The war brings almost incalculable demands for fastenings, and Bethlehem's fastening division is turning them out in torrents, from standard bolts, nuts and rivets, to special items like these tank rods, for use in fighting equipment and in war production plants at home.

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.
Bethlehem Steel Export Corporation, New York City

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pipeline to BERLIN

Scene 1. Part of a large order of six-inch ARMCO Spiral Welded Pipe ready for shipment to the "invasion coast." Mile after mile of this sturdy steel pipe is ready for overseas duty —"somewhere" on the war fronts.

Scene 2 is yet to come. Inland from the beachheads, Army engineers will lay pipe as fast as the front moves forward. Through these lifelines will flow the water, oil and gasoline that keep an army on the go.

Scene 3 is postwar, when ARMCO Spiral Welded will be back at old familiar tasks. It is amply strong (ultimate strength of 50-60 thousand pounds a square inch) without the burden of excess weight. You save money on hauling, handling and installation. The long 50-foot sections mean fewer joints, less assembly work. A spun enamel lining assures continued high flow capacity; tuberculation and costly cleaning are out.

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EXPORT: THE ARMCO INTERNATIONAL CORPORATION

ARMCO

ARMCO SPIRAL WELDED PIPE

at a harder pace than ever before. T booklet was produced with the id of helping users to get the most out their existing drives and save so costly delays and unnecessary expens —*Chain Belt Co., 1600 West Bru St., Milwaukee 4, Wisconsin.*

Truck Tire Care—A booklet f truck owners or operators acquain them with the most common causes truck tire failures and points out ho these can be prevented. It is illustrat and lists overloading, improper inf tion, excessive speed, impacts, mecha cal irregularities, improper matching duals, cuts and punctures as the eig most common causes of premature tru tire failures.—*The B. F. Goodrich C Akron, Ohio.*

Aluminum Notebook—Twelve ec nomic advantages of aluminum a listed in a handsome illustrated bookl as follows: Light weight, high resi ance to corrosion, high electrical co ductivity, high conductivity for he high reflectivity for light and radia heat, workability, non-toxic, strength alloys, non-sparking, non-magnetic, a pearance, and high scrap and re-u value.—*Aluminum Co. of Ameri Pittsburgh, Pa.*

Industrial Steam Locomotives—A n catalog giving technical data on ind trial and railroad switching locomoti has been announced. Latest in a ser dating back 75 years, the catalogue an authoritative review of the curr field of industrial and switching ste engines. More than 50 locomotive ty are illustrated, with complete specifi tions and performance data in t majority of cases. Articles on stand specifications, tractive force, and m ern procedures in locomotive ope tion are illustrated with mechani drawings and tables.—*H. K. Porter C Inc., Pittsburgh, Pa.*

Thread Milling Cutters—A 6-page, color technical and descriptive bulle listing over fifty standard blanks thread milling cutters, carried in sto ready for thread grinding to us specifications, has just been m available.

Reference to this bulletin simpli ordering, eliminates special cu design and enables faster delivery most thread milling cutters.—*Det Tap & Tool Co., 8432 Butler A Detroit 11, Mich.*

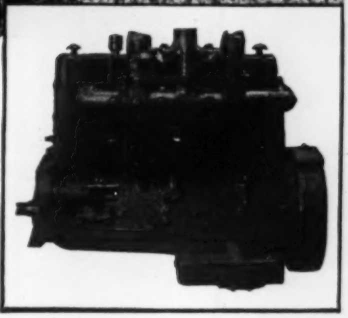
Tools and Blanks—The first section this catalog contains specifications prices of standard tools together w line cuts, halftones, and representat applications. The second section g similar information for typical to including new lines of solid round square precision boring tools; formation on standard and non-rd blanks, and specialties, such e and grinder centers, balls, gage tc. The third section tells how cify and order tools and blanks, ation on the several types of chip rs, instructions on brazing blanks s shanks, proper grinding meth-d the milling of steel with car-pped cutters of simple design.—*-metal Inc., Lloyd Avenue, La-Penna.*

erproofing Concrete—Corrosion eterioration, traditional foes of nance engineers, are sabotuers k in every plant. For plants keep running smoothly, often in f peak wartime loads and priori-hich often mean getting along hat equipment you have. The ay out is to protect your plant quipment to the utmost. Pro- coatings have been doing this f a job on concrete and steel for ears. The war emergency makes asting qualities more valuable. anufacturer's product is said to pecific coating problems on con-or steel surfaces either wholly ged or in atmosphere saturated oisture or gases. An index in lder outlines some recommenda-*Inertol Co., Inc., 470 Frelinghuy-, Newark, N. J.*

er Connector Construction—De- using the timber connector of construction will find valu- new design manual for timber or construction. The 40-page ers complete design information g data on load values, spacings, e material is in chart form for se of architects and engineers ludes such additional informa-recommended cambers for stand-sses, approximate weights of var-mber connectored roof trusses table of dimensional properties rican standard-size lumber. The esented are drawn in accordance e recent WPB *National Emer-Specifications for the Design, tion, and Erection of Stress Lumber and Its Fastenings* which mandatory on November 1.— *Engineering Co., Washington,*

lar Scaffolding — Construction o have used tubular scaffolding and have discovered the ease ich it can be made into access es of various sizes and shapes be surprised to learn that this aterial has found a definite use.

mies make progress they in- find the retreating enemy has



M-4 MILITARY TRACTOR Powered by WAUKESHA ENGINE—Co-operating with the Army Ordnance Department, Allis-Chalmers Tractor Division designed and is building M-4 Military Tractors. The power plant, a Model 145-GZ Waukesha Engine was designed and is being built by the Waukesha Motor Company.

MODEL 145-GZ WAUKESHA ENGINE
Six cylinders, 5¾ in. bore x 6 in. stroke, 817 cu. in. displ. Burns gasoline . . . is designed to use modern aviation fuels . . . develops high output. And it's really rugged! Crankcase and cylinder block cast as a single unit. Crankshaft is drop-forged steel, heat treated. Wet sleeve cylinders easy to remove and replace. Positive pressure oiling. Thermostatic by-pass system guards against over-cooling, assures quick warm-up when starting.

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The motive power of men and mules that once hauled artillery isn't fast enough for this war. To get there *first* with superior fire power, our Field, Coast and Anti-aircraft Artillery must move faster . . . *and faster!*

Neither shell holes nor ditches, muck, mud nor mountains stop the new track-laying M-4 Military Tractors from moving the heaviest guns into position. Powered with Model 145-GZ Waukesha Engines, they have all the pulling power of a track-type tractor plus the smooth eager speed of a truck.

This is a wartime Waukesha Engine . . . a special development for combat service in heavy ordnance equipment . . . a super power plant built by Waukesha to out-power and out-perform any similar engine of the same size ever produced!

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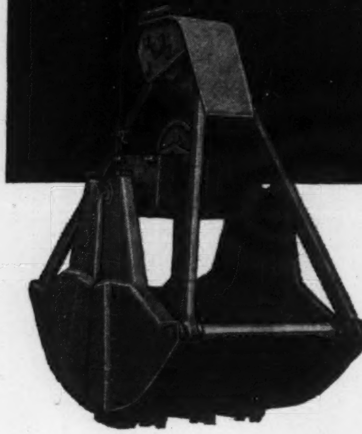

New and exclusive Johnson features give this new streamlined bucket efficiency-promoting and life-prolonging advantages in all centers of action.

Needle Bearings Sealed Against Dirt

All-Welded Construction Reduces Digging Resistance

Its all-welded construction eliminates power-wasting bolts and rivets . . . provides greater stability through proper weight distribution.

A renewable lip edge bar, of durable manganese steel, gives greater digging efficiency and many times the life of the ordinary steel lip construction.

Renewable Manganese Steel Lip Edge

Large Diameter Sheaves Increase Rope Life

Guide sheaves replace conventional cross-rollers . . . greatly reducing cable wear. Needle bearings (protected against dirt by special synthetic rubber seals) are used on all closing sheaves.

General Purpose Type (½ to 2 yard capacity) in stock for immediate delivery to U. S. and Canadian contractors with required Government authorization. The line also includes Rehandling Buckets ½ to 2½ yards, Heavy Digging ½ to 1½ yards.

Get Data on Johnson Bins —Batchers— Ready-Mix Plants

The C. S. Johnson Company
Champaign, Illinois

destroyed bridges, piers, and other installations. These can be quickly replaced with a simple, portable construction material that fits together like a Meccano set. From five standard parts can be formed unloading piers, ramps, bridges, water towers, derricks, towers for observation, and machine gun emplacements, and even huts and shelters.

The material required for some of these installations together with the steps necessary to assemble them is discussed in a bulletin.—*Dravo Corp., 300 Penn Avenue, Pittsburgh 22, Pa.*

Scientific Inspection—A new handbook on scientific inspection is being released. It covers the entire subject of precision measurement. Photographs, diagrams, charts and tables make its explanation of scientific inspection interesting.

The booklet is dedicated to Eli Whitney, the father of mass production, whose invention of interchangeability of parts has become highly developed through the use of precision measuring instruments to interpret fine dimensions. Of interest are the many tables and data on gaging methods. One section explains the use of many precision instruments such as the sine bar, vernier gage, optical flats, etc.—*Continental Machines, Inc., 1301 Washington Ave., South Minneapolis 4, Minn.*

Feed Water Regulation—The sixth edition of the textbook, "Mechanical Feedwater Regulation for Boilers," by Professor E. P. Culver is now available. It covers the principles of boiler feed water control, and describes mechanical equipment available to meet various operating conditions. Differential control and feed pump control are also discussed. There are numerous illustrations, diagrams, and chart reproductions.—*Northern Equipment Co., 1945 Grove Drive, Erie, Pa.*

Materials Handling—A very handsome book has been issued telling the whole story of "Modern Materials Handling Machinery Applied to American Industry." It is profusely illustrated with photographs showing the equipment in use in many different types of business. The thought back of this publication is "American industry must now attain even greater efficiency and at the same time prepare for the inevitable new challenge—competition in world markets against labor costs which, even though world living standards rise, will still be lower than our own. The next great reduction in American production costs can be effected by cutting materials handling costs with the use of the most modern equipment and methods."—*The Yale & Towne Mfg. Co., Philadelphia, 24, Pa.*

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MEETINGS

ERICAN WOOD PRESERVERS ASSOCIA-
, annual meeting, Palmer House,
ago, Ill., April 26.

ERICAN SOCIETY FOR TESTING MATE-
s, 47th annual meeting, Waldorf-
ria Hotel, New York, N. Y., June

ONAL AND LOCAL MEETINGS

S SECTION, AMERICAN SOCIETY OF
ENGINEERS, spring meeting, Dris-
Hotel, Austin, Texas, April 26-27.

SPRING WAR CONFERENCE OF THE
YORK SECTION OF THE AMERICAN
ER WORKS ASSOCIATION, Hotel
a, Utica, N. Y., April 27-28.

SOUTH SECTION, AMERICAN So-
Y OF CIVIL ENGINEERS, annual spring
ing, Commission room of State
way Department, Little Rock, Ark.,
l 28.

IDA ENGINEERING SOCIETY, annual
ing, Miami Beach, Fla., April 27-29.

HEASTERN SECTION, AMERICAN
R WORKS ASSOCIATION, 1944
ing, Greenville, S. C., May 8-10.

JERSEY SECTION, AMERICAN WATER
KS ASSOCIATION, Trenton, N. J.,
11.

ENGLAND SEWAGE WORKS ASSOCIA-
spring meeting, Hotel Kimball,
gfield, Mass., May 17.

TY FOR EXPERIMENTAL STRESS AN-
s, The Hotel Statler, Boston, Mass.,
18-20.

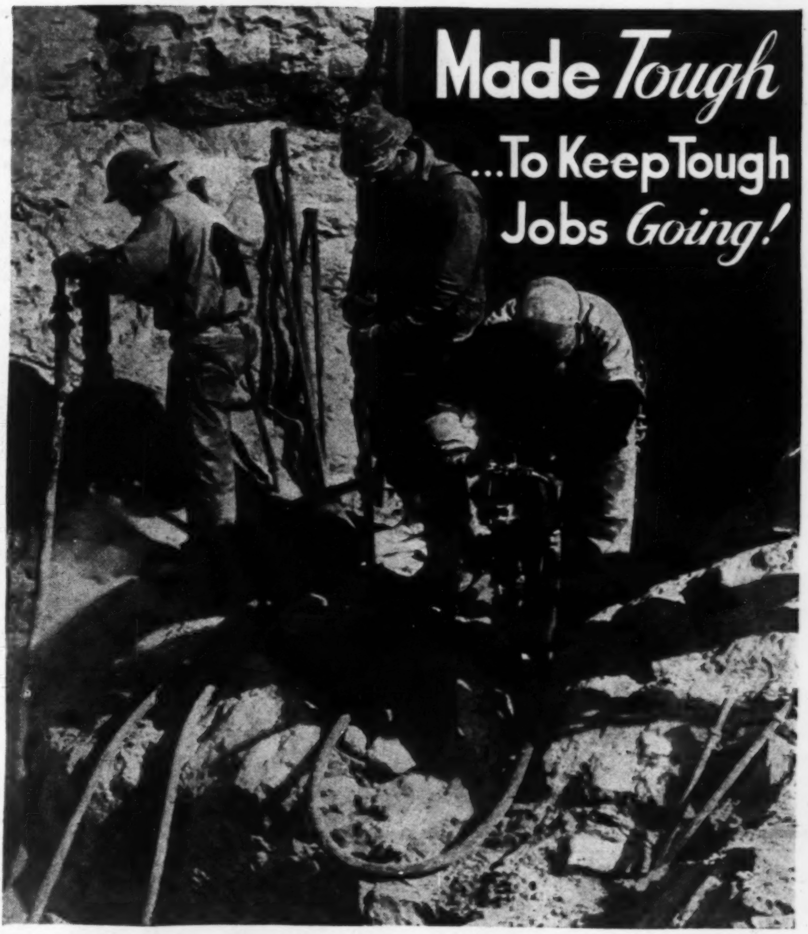
LAND-DELAWARE WATER AND SEW-
ASSOCIATION, 18th annual confer-
Lord Baltimore Hotel, Baltimore,
May 19-20.

RAL STATES SEWAGE WORKS ASSO-
N, annual convention, Oshkosh,
June 22-24.

Elections and Activities

I. Gregory, chief engineer in
ville, Ky., has been elected presi-
of the Engineers and Architects

er officers are: Vice president, A.



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GOODALL'S famous heavy-duty hose for rock drill and other pneumatic tool service. Wrapped duck construction. Tough, durable cover to effectively resist severe abrasive wear. Strong, long-life carcass to withstand rough handling and excessive pressure surges. Synplastic tube for protection against the action of oil. Ask for STYLE D-142, in any size from 1/2" to 1 1/4". Maximum lengths, 50 feet.

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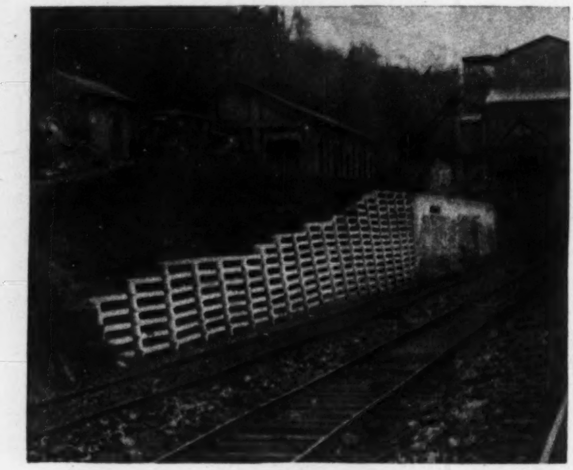

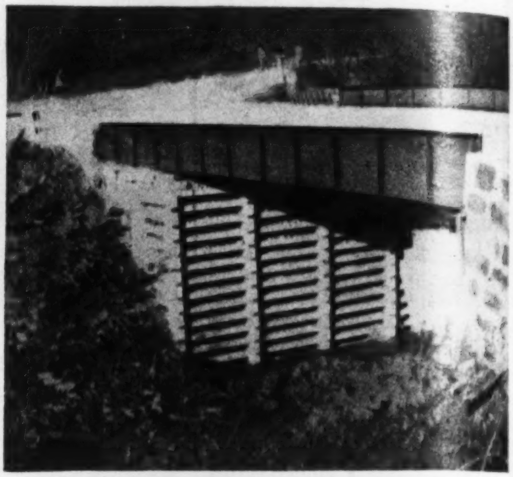

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Dounda; secretary, George W. Hub-
and directors, George M. Eady,
H. Kurrasch, Maurice Miller, E. R.
ald, A. G. Rosenbaum and J. L.
mpson.

he officers of the New York State
ociation of Builders for 1944 are:
ident, George W. Walker; first vice-
ident, A. E. Henderson, Albany;
nd vice-president, Cyril J. Statt;
l vice-president, William J. Olvany;
rman executive committee, Fred De-
ey; counsel, Ernest F. Eidlitz, New
k. Harry C. Taylor, secretary-treas-
, was continued on a month-to-month
s.

fficers of the Baton Rouge section of
Louisiana Engineering Society are:
L. Lehman, president; Hamilton
son, first vice president; Jos. T.
ien, second vice president; and P.
uelfi, secretary-treasurer.

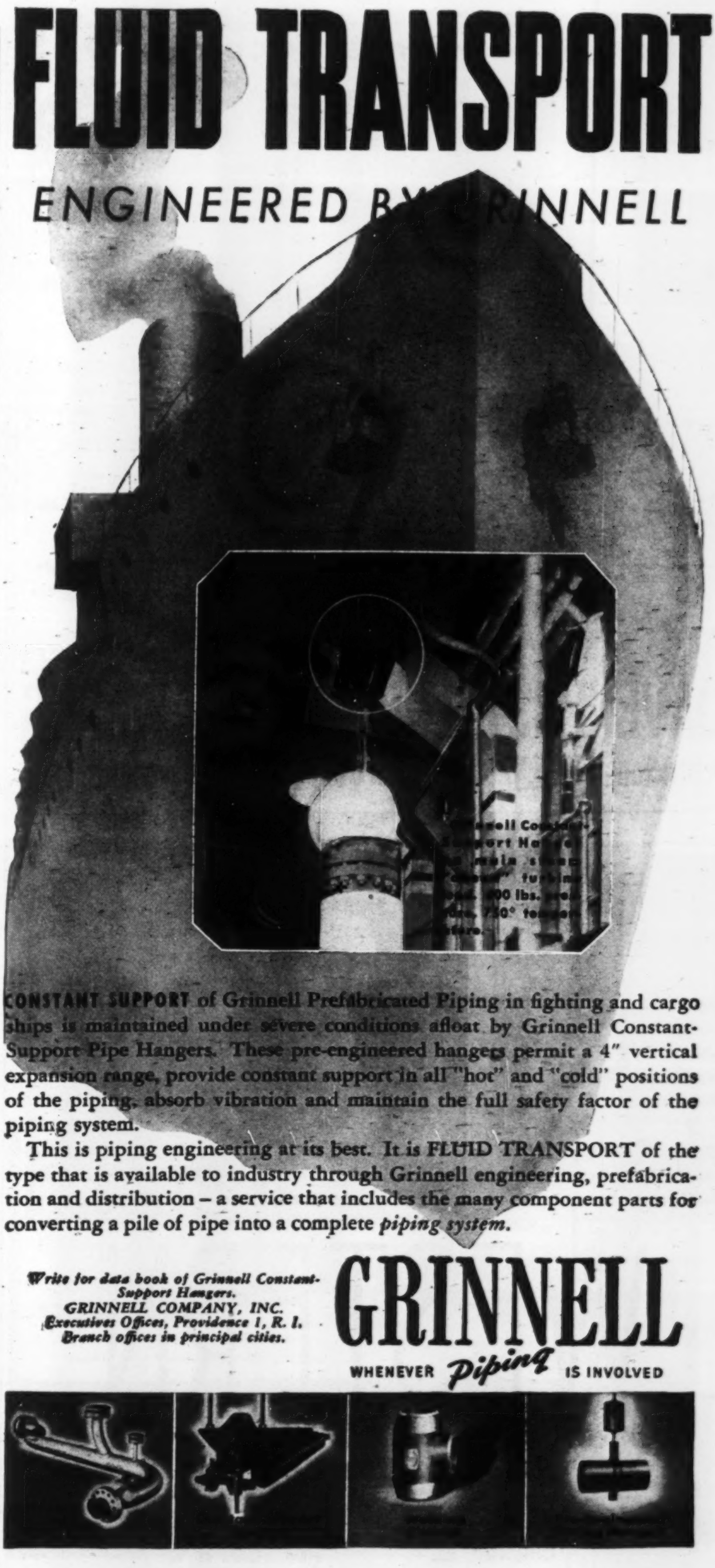
fficers of the Kansas City section of
A.S.C.E. are: O. W. J. Anchuetz,
ident; Melvin P. Hatcher, vice-
ident; C. R. Van Orman, vice-presi-
; Ansel Mitchell, secretary-treas-
; Joseph W. Ivy, retiring president,
be a director for the coming year.

hn Bennett was elected president of
Vancouver, B. C., General Contrac-
Association. He succeeds M. C.
eron, who automatically is a mem-
n the board of directors. Harold H.
son was named first vice-president
Wm. Greenlees, second vice-presi-
Directors: Fred J. Dawson, John
er, A. J. Armstrong, Ralph C. Py-
nd Douglas Welch.

orge Buck, roadmaster for Multno-
county, has been elected president
e Association of Oregon Counties.
Morgan, Union County Engineer,
lected vice president and Paul B.
ing of Jackson county, secretary-
urer.

C. Crawford, Iowa City, Ia., was
d president of the Iowa Section of
merican Society of Civil Engineers
tly, to succeed Raymond Zack,
n City. Frank Kerekes and L. O.
rt, of Iowa State college, Ames,
elected vice-president and secre-
reasurer, respectively. City Engi-
John Tippee of Des Moines was
n a two-year director and L. W.
e, Ames, a one-year director.

in A. Langer has been elected
ent of the Builders' Exchange of
ukee. Other officers elected are
n R. Harms, first vice president;
r M. Ericson, second vice presi-
Anton Hennecke, secretary; Wil-



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CONSTANT SUPPORT of Grinnell Prefabricated Piping in fighting and cargo ships is maintained under severe conditions afloat by Grinnell Constant-Support Pipe Hangers. These pre-engineered hangers permit a 4" vertical expansion range, provide constant support in all "hot" and "cold" positions of the piping, absorb vibration and maintain the full safety factor of the piping system.

This is piping engineering at its best. It is FLUID TRANSPORT of the type that is available to industry through Grinnell engineering, prefabrication and distribution – a service that includes the many component parts for converting a pile of pipe into a complete *piping system.*

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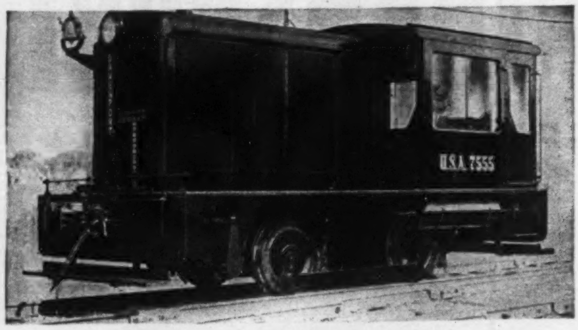

A vast array of public works projects are in the planning stage. America is wisely looking ahead—and not letting up one iota in the grim, hard job of winning the war. We can win the peace only by providing a lot of jobs QUICKLY when the shooting is over.

Many of these post-war public works projects will call for locomotive haulage and we urge you to rely upon the outstanding merits of Davenport Locomotives for those tough, gruelling tasks that lie ahead. We cannot accept private orders at this time without permission from Uncle Sam. All of our energies are producing Davenports for war services all over the world. We can, however, assist you NOW in determining your haulage requirements so that earlier deliveries will be possible when the time for action comes. Better-Built Davenports will insure that long-lived dependability you will be demanding.

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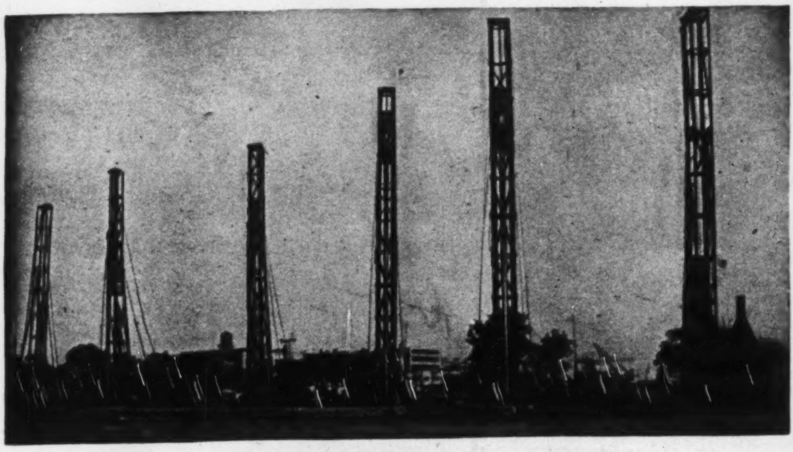

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liam F. Eichfeld, treasurer; Gustave Trepte, Henry J. Wussow, Allan C. Tr chel, Roland L. Beutell, directors.

G. F. Fountain has been elected pres dent of the British Columbia Land Su veyors at Vancouver, B. C.

A. L. Atherton of the Atherton Co struction Co., has been installed as 19 president of the Seattle Chapter, Asso ated General Contractors of Americ J. C. Boespflug was named vice pres dent, Don Mowat, secretary, and O. Daniels, treasurer. Named to the exec tive committee were C. F. Sanbor George Teufel and Noble W. White.

Elected as president of the Engineer Club of Seattle is F. M. Kettenrin Serving with him will be Ray Tro bridge, Jr., past president; A. L. Athe ton, vice president; Evans K. Blackfor secretary; E. D. Alexander, treasure and the following members of the exec tive committee: Ralph F. Dreitzler, S. Leckenby and J. H. Stevenson.

The Mountain Pacific chapter of t Associated General Contractors, wi headquarters at Seattle, has elected t following officers: Elmer J. Whi president; M. P. Munter, vice preside and Harry H. Hawkins, treasurer.

Principal officers of the New Mexi Society of Engineers were re-elected a recent meeting in Albuquerque, a two new directors were added to t board. Officers are C. B. Beyer, pre dent; E. B. Bail, vice president; W. Wagner, secretary-treasurer; and Jo M. Kelly of Santa Fe, director. Ne directors are H. L. Jones, professor electrical engineering at the Universi of New Mexico, and Jake Harris of t New Mexico state highway departme

The Building Contractors Associati of Vancouver, B. C., recently re-elect S. D. Buzzelle president. A. C. Orr w re-elected vice-president and Chas. Thorn was named secretary-treasure Members of the executive committ are: W. P. Perkins, A. H. Mitchel Geo. Sinclair, G. B. Croome, M. A. Mo son, and C. M. Sharpe of West Va couver.

The Sam Houston Water Associati made up of municipal and private i dustry water plant operators at Housto Tex., elected T. L. Satterwhite, Ralph Wallace, James M. Welsh, and Walter Price, directors; R. B. Allen, Garn West, L. P. White, and C. I. Starne vice presidents; and W. F. Lehde, pre dent.

At the annual meeting of the Asso ation of Professional Engineers of Ne Brunswick, J. T. Turnbull of St. Joh was elected president; A. S. Gunn, cton, vice-president; A. Gordon, to resent the Moncton district, and B. Hagerman, the Fredericton district.

t the annual meeting of the Associ- General Contractors of Missouri, following officers were elected for 4: President, E. C. Atkinson of C. H. inson Paving Co., St. Joseph; vice-sident, B. W. Tibbs of Rock Hill halt & Construction Co., St. Louis; surer, J. M. Joyce of Cameron, e & Co., Keokuk, Iowa; secretary, C. L. Wagner, Jefferson City; as-nt secretary, Florence Hurlbut, Jef-on City.

he Highway Construction Industry outh Dakota, Inc., recently affiliated the Associated General Contractors America, includes 20 highway con-tors. Officers are C. A. Wagner, x Falls, president; Owen Mann, id City, vice president; and J. L. eri, Rapid City, secretary-treasurer. ectors in addition to the officers are H. Lien, A. L. Hyde, and S. S. Rob-, Rapid City; Les Trotman, Miller; Cecil Bartholow, Huron.

t the annual meeting of the Halifax, S., branch of the Engineering Insti- of Canada, it was disclosed that the nch has 237 active members. Officers ted: Chairman, G. J. Currie; secre-, S.W. Gray; auditors, M. Lee and Martinex; executive, H. A. Ripley, . March and C. D. Martin; execu- for outside Halifax, J. H. M. Jones R. J. Bethune; scrutineers, L. A. chell and R. M. MacAlpine.

obert P. Bayard of New York City been elected president of the New k Highway Chapter, Associated Gen- Contractors. Other officers are Wil- H. Peckham, White Plains, vice-sident; C. W. Maxwell, Albany, sec-ry-treasurer, and Henry L. Deming, any, managing director.

ivian B. Jones, associate engineer in Tacoma, Wash., city department of lic utilities, has been elected presi-t of the Tacoma Engineers Club. J. er Sharp was named first vice-presi-t; W. G. Atkinson, second vice-presi-t; Fred M. Veatch, secretary-treas-; Earl G. Bailey and G. M. Rodside, utive committee members.

. B. Spencer, Waterloo, Ia., was ted president of the Central branch he Associated General Contractors s convention in Des Moines recently. er officers named by the branch were H. Carlson, Decorah, vice president; k W. Lippert, Boone, vice president, J. Leo Hoak, Des Moines, treasurer. . Welden, Iowa Falls, and Herman Sani, Des Moines, were chosen to

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You've heard those wonderful stories about the sizes of objects that can be swallowed by some varieties of fishes and snakes. Here are two bona-fide photographs of Morris Centrifugal Pump impellers with objects that have passed through them.

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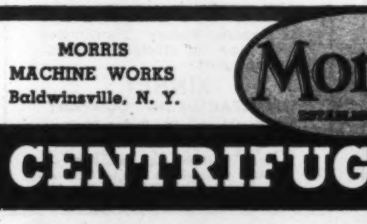

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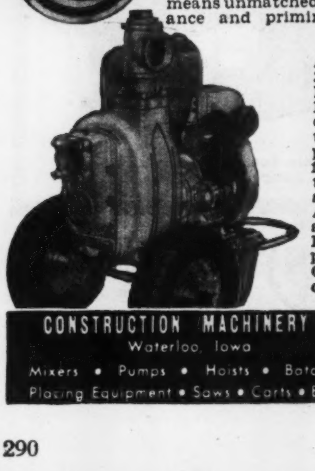

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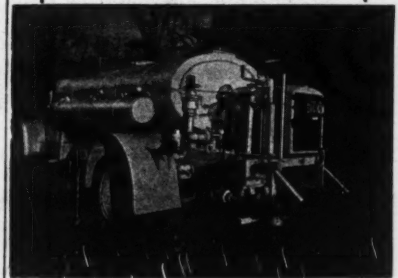

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three-year terms on the branch's b
of directors.

At the same time, the Master Buil
Association of Iowa elected H. W. We
Des Moines, president; Russell Tho
son, Ames, vice president; W. F. I
charo, Des Moines, secretary, and O
Conlon, Dubuque, treasurer. New di
tors elected for three-year terms by
association were O. Conlon; Carle R
Mason City; A. R. Coffeen, Decor
Paul McCorkle, Sac City (now
Brazil) and O. F. Paulson, Ce
Rapids.

Godfrey Swenson, president of
Swenson Construction Co., Kansas C
Missouri, has been elected president
the Kansas City branch of the Asso
ated General Contractors for the y
1944, to succeed J. E. Dunn, of the J.
Dunn Construction Co., Kansas C
Other officers elected were Roy T. C
lins, vice president, and Carl T. Sta
treasurer.

Officers and directors of the Virgi
Road Builders Association are: pr
dent, Kenneth L. Black, Richmo
vice president, Nat Pendleton, Wyth
ville; secretary-treasurer, Henry C. H
heimer II, Norfolk; executive secreta
A. J. Rayner, Richmond; directors:
T. Cunningham, Jr., Roanoke; W.
Penick, Richmond; W. Hunter Se
Franklin; E. W. Hechler, Highla
Springs; Robert Barnes, Blackstone
Frank Echols, Staunton.

Francis H. Kingsbury, senior sanita
engineer, Massachusetts Department
Health, has been elected president
the New England section, A.S.C.E. Wi
liam M. Bassett, engineer of structure
New England Power Service Co., Bo
ton, was elected vice president. Fra
M. Carhart, Charles L. Hammond, Si
B. Phillips, Charles B. Price and Bu
B. Brown, all of Boston; Hiram Mille
Bangor, Me., and Paul D. Sargent, Me
ford, Mass., received life membershi
certificates at the recent annual me
ing.

At the annual meeting of the Munic
pal Engineers, a society composed
technical men serving in the vari
borough offices and department of t
City of New York and in the seve
governmental authorities in the metr
politan area, Honer R. Seeley, Dep
Commissioner of Public Works, w
elected president and Ernest F. F
designs engineer, Borough of the Br
first vice president. Chas. W. Willi
Assistant Commissioner, Manhatt
Borough Works, was elected second v
president. Directors elected for a th
year term are: Joseph C. O'Dea, J
P. Lonergan, Joseph M. Lonergan, W
liam Spivak and James I. Rooney.

EN

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Major Gen

UGH J. C

Chief Eng

west Pa